Lithium Stocks + Sector Risk and Reward Analysis

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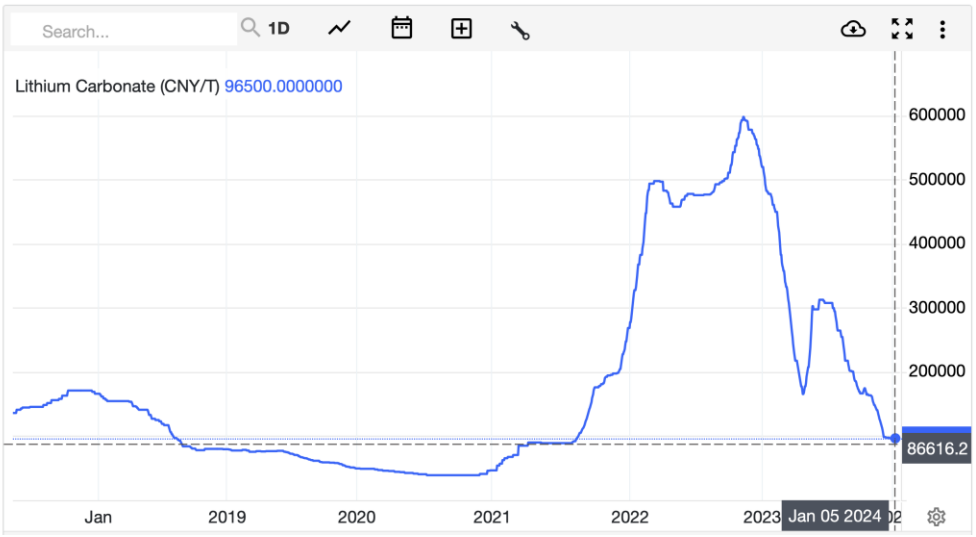
Executive Summary

Producers expect a 25% supply deficit by 2030 and a $20k lithium price necessary to justify fulfilling that kind of demand. However, reality tells us that the lithium market will most likely be in oversupply till 2028, which consequently means low prices. And then yes, after 5 years of low prices, we could have supply deficits, but not on the scale producers are predicting now.

If we have oversupply for a few years, and low lithium prices, new investments might not be incentivized and then we can again have a boom like we had in 2022 and 2023. But for that to happen, we first need a few bad years.

The current price of lithium is around $13k.



Spodumene prices are lower at $1,000 and if prices remain where those are, the environment could look very ugly the next few years as all producers have invested significantly in growth.

If that growth in demand doesn't materialize, and there is a huge difference between 30% and 20% growth per year, where it is impossible to predict now what growth rate will there

be, market valuations will have to adjust to a new environment, and create opportunities as markets like to overshoot on both sides, up or down.

Of the miners out there, Pilbara, IGO and Arcadium are the ones I'll watch closer going forward, the rest is either too pricy or their estimations are too exuberant. I like the low cost production that leads to profitability in whatever environment where you can wait for the ugly times to pass, and like it is usually the case with cyclical commodities, after bad times come good times.

But, we have seen bad times only for a few quarters now, wait for the things to clear up, for what you usually need a few years. The current situation in the lithium world, especially after the booming 2022 and 2023, reminds me of the early 2010s for copper where high prices led to high investments that ended up with low prices for half a decade.

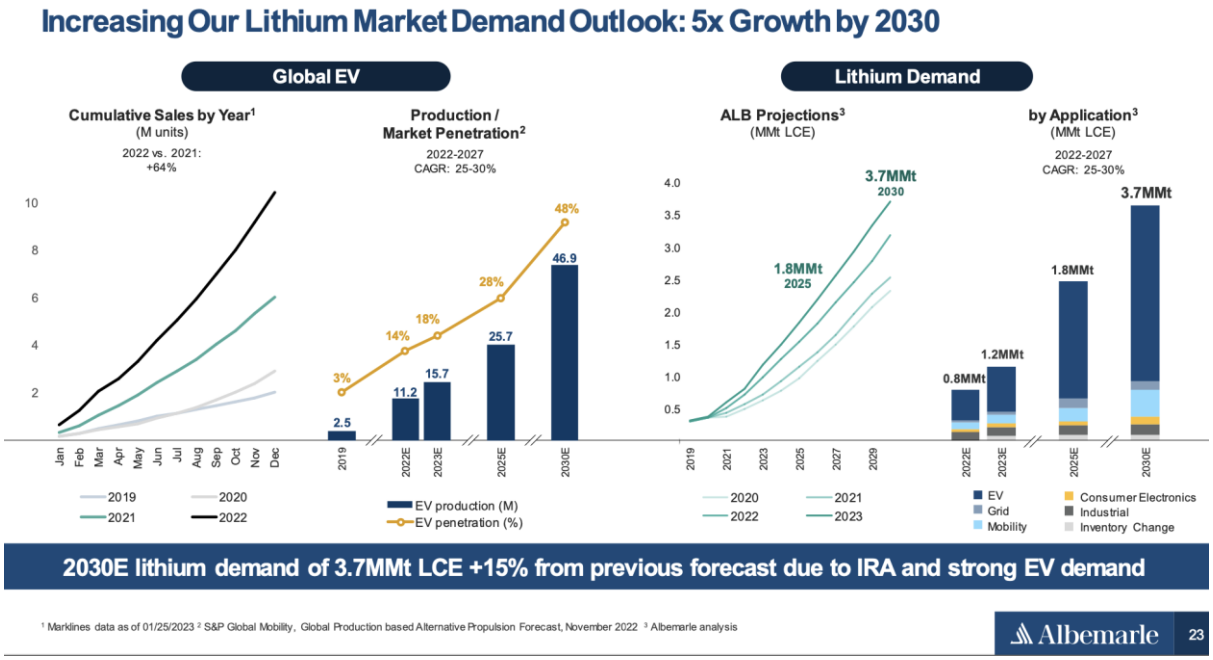
For the mess to be cleaned, going from oversupply to a deficit, I think we still have to wait a few years. Waiting is not a problem for me.

Investing in Lithium Stocks- The Lithium Sector

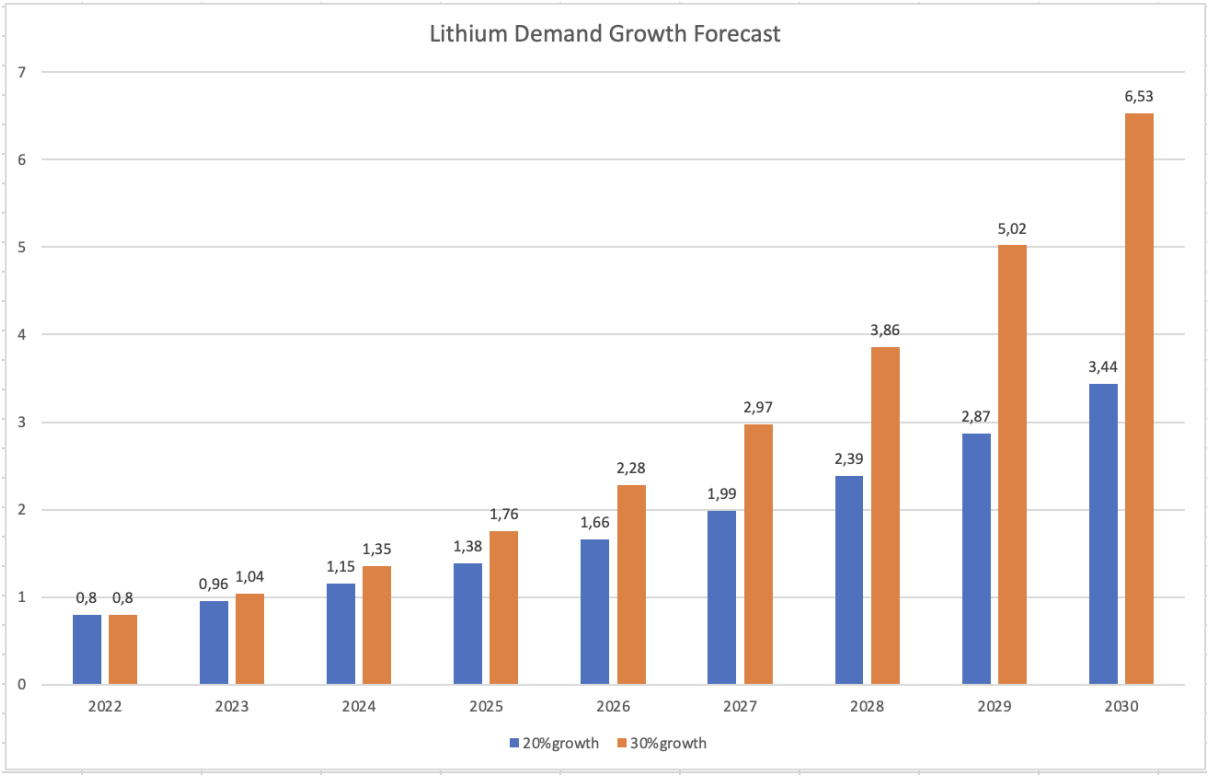
My lithium market analysis won't be as exuberant as some producers show, but this doesn't mean we can't make money as investors, we just need to have the right data to understand correctly how the key moving factors behave.

Lithium Supply and Demand Forecast

Of course, if you ask lithium producers, the sky is the limit when it comes to demand growth ahead for lithium products where Albemarle just recently increased its lithium market growth projections to a 25% to 30% yearly growth rate up to 2030.



The previous growth projections were between 20% and 30% growth per year. Such growth rates might sound stellar, but there is a huge difference between 20 and 30%. If we take the 2022 0,8MMt demand for lithium and grow it by 20 and 30%, the ending demand balance for 2030 varies hugely. Namely 6.53MMt at 30% and 3.44MMt 20%.



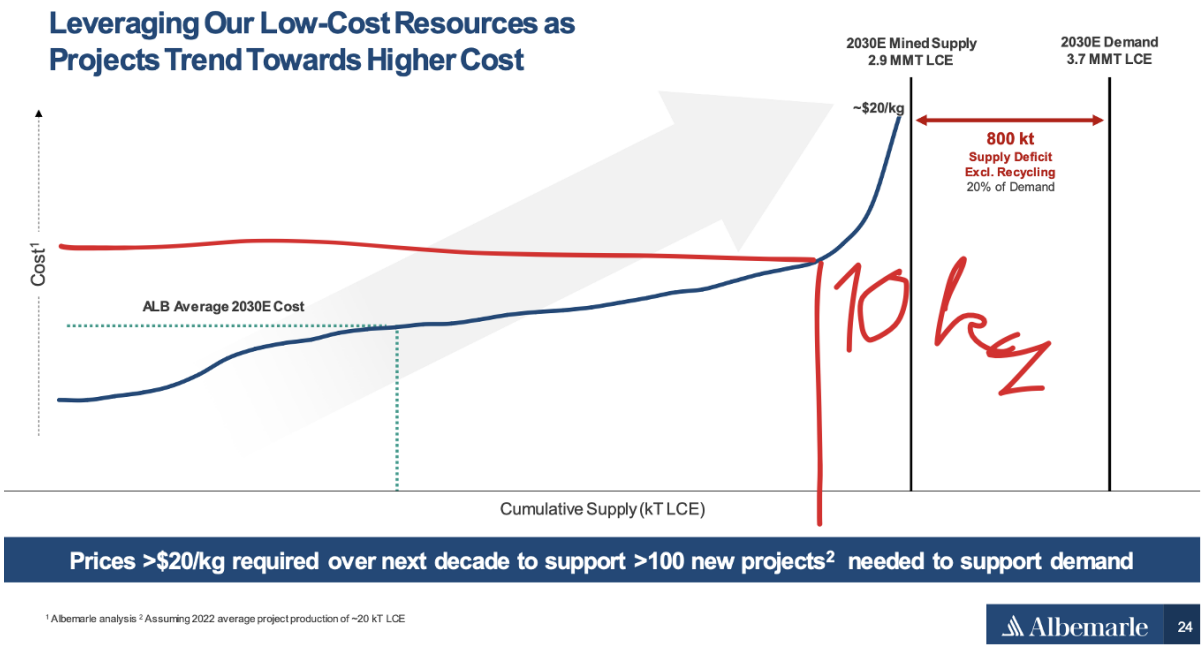
(note: Albemarle's growth rates hit double their own projections - see below)

We all know it is impossible to predict whether the growth will be 20% or 30%, but what we know now is that the difference between the two above scenarios will have huge repercussions on investors and stock valuations.

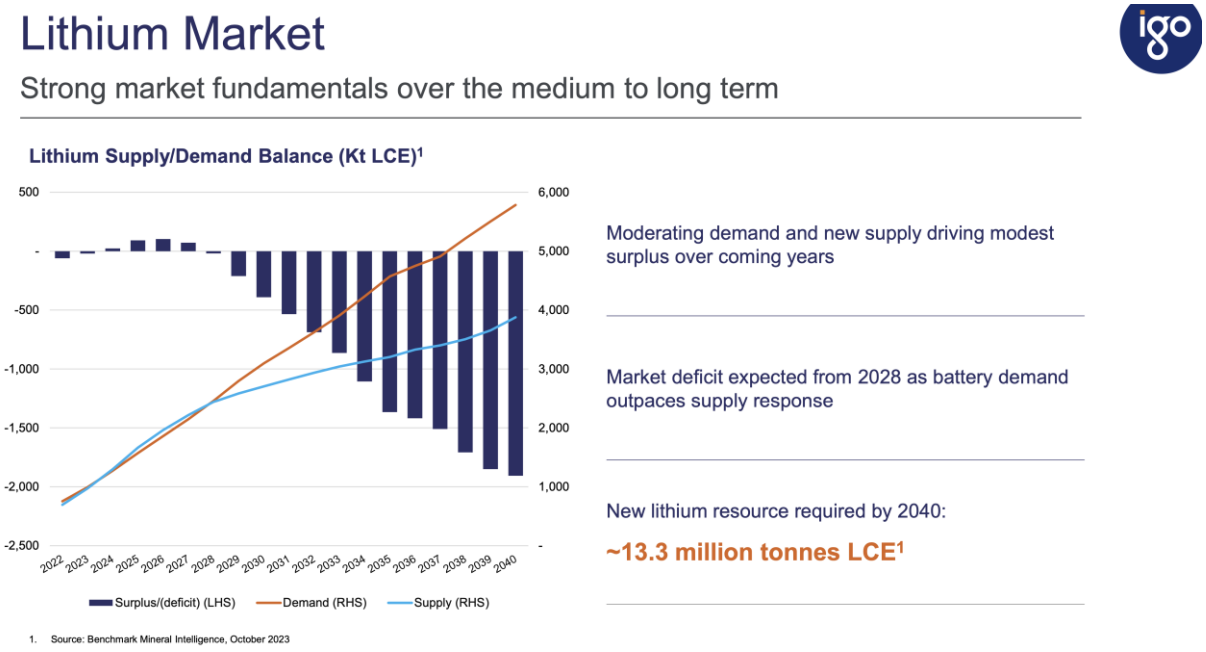
Reality might be different as Albemarle's 5X market growth projection is just an estimation on already past, very exuberant 2023 trends. Recessions, interest rates, lower than expected short term demand or higher than expected supply and many other things might change the supply and demand balance, not to mention possible technology change implications.

Future lithium prices will depend on demand and the cost of supply. The hockey stick estimated cost curve shown below for 2030 means there will be huge fluctuations in lithium prices because small changes in demand will have huge impacts on prices. Albemarle says there will be an 800kt supply deficit by 2030 but over the years, I've learned to never trust these deficit charts as over 7 years, all producers will invest to cover for the supply predicted deficit.

If I adjust for the tail steepness of the cost curve, the hockey stick, I get to long-term prices of around $10 per kg or $10k per ton, which is in line with some predictions like Goldman's and far from the producer's projections of $20kg per ton.

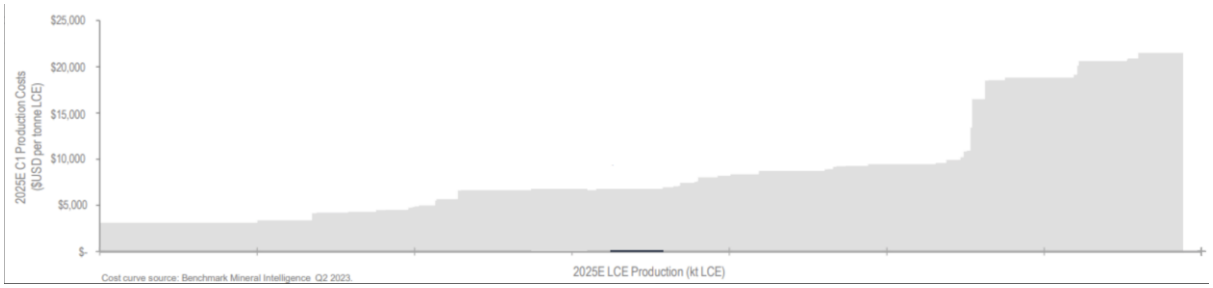


Further, given current tangible projects, the lithium market is expected to be in oversupply till 2029, which means low prices.

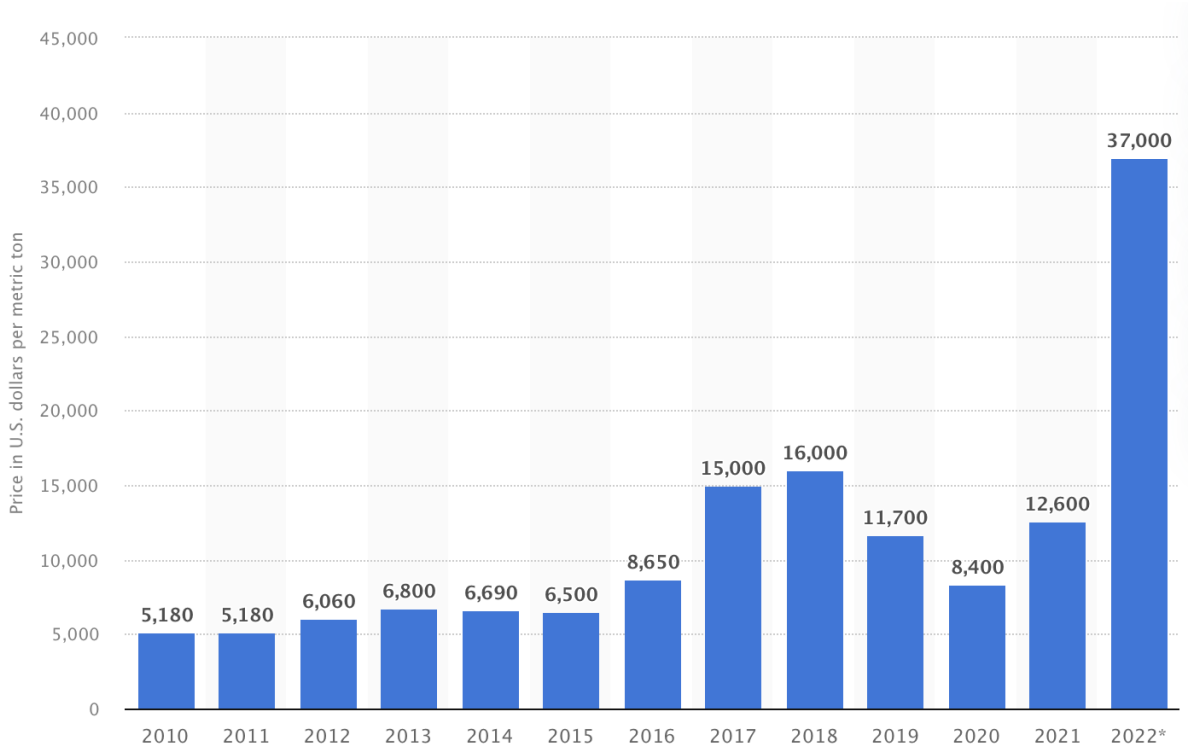


Thus, for conservative stock valuations I have to take $10k per ton as a long-term price. There had been a spike in 2022 but prices have returned to the low teens which seems also to have been the average over the last 7 years.

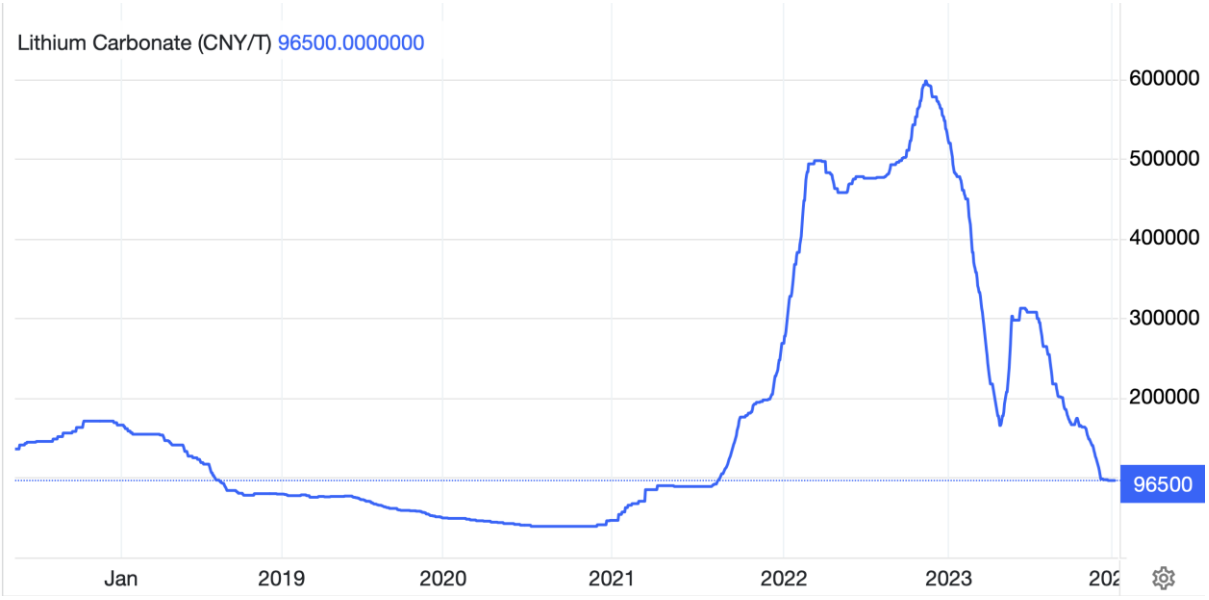
I have found a 2025 projected cost curve and again, if we eliminate the spike on the tail of the curve, we are at $10,000 per ton.



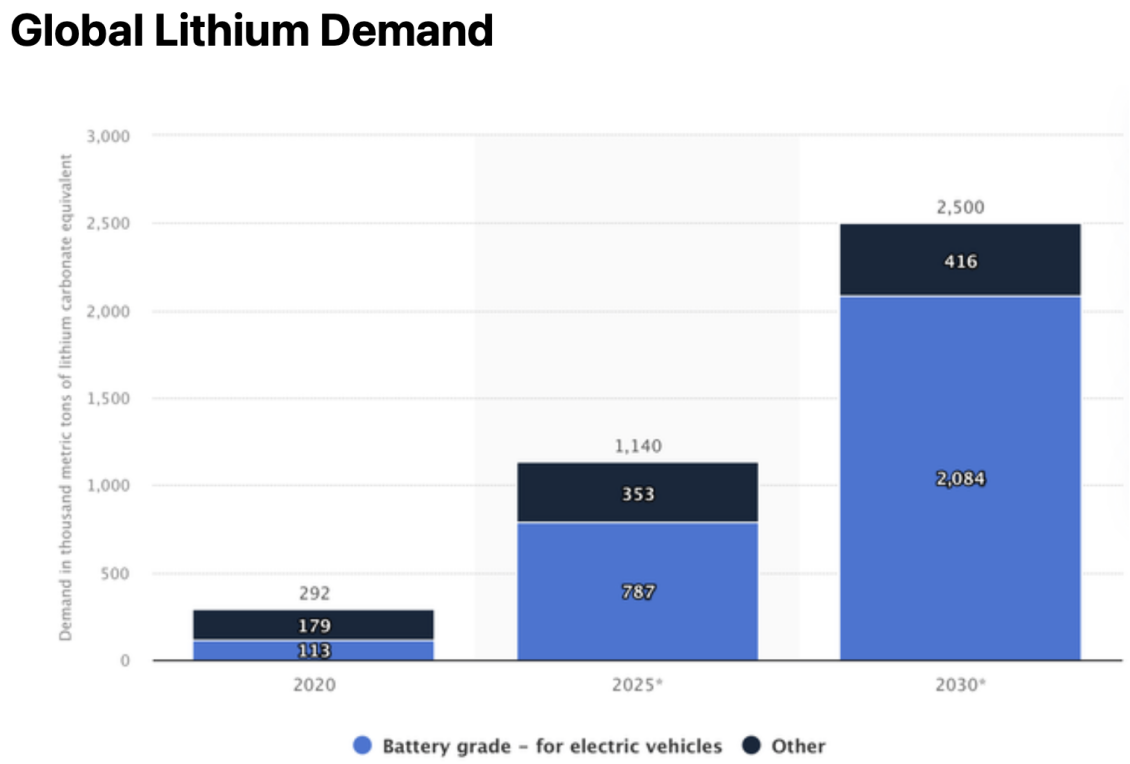
The $10 thousand per ton are also in line with historical prices and producer costs.



The current price is 96000 CNY per ton or $13500 USD.



Further on the variance in forecasts for demand, Albemarle forecasts 3.7k tons in demand for 2030 while Statista gets to just 2.5. That is the different between $25k per lithium ton and $12.5 and a has a big impact on lithium stock valuations.



I have researched the top lithium producers out there and have come to the following supply situation:

Albemarle - 600kt at cost between $5 and $25 by 2027

SQM - 270kt by 2027

Arcadium - 250kt by 2027

Ganfeng - 600kt by 2030

Sigma - 100kt by 2025

Pilbara - 100kt eq by 2025

Mineral Resources - 100kt eq by 2027

IGO + Tianqi Greenbushes - 250kt eq by 2028

Liontown - 100kt eq by 2027

Piedmont Lithium - 110kt

That in summary tells me that by 2027 we could have 2.5MMT of lithium equivalent supply on the market which already covers for Statista's 2030 demand expectation.

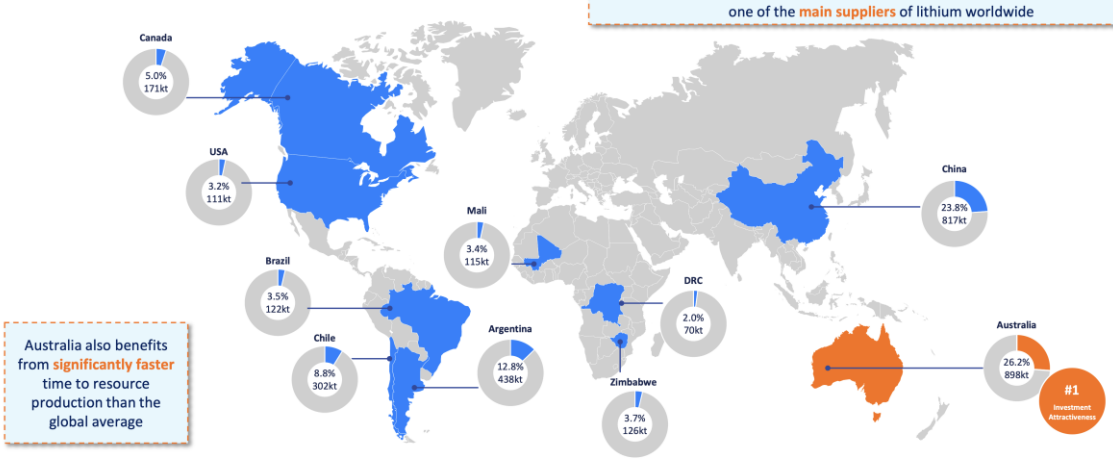
Then I found this projection from Liontown showing their estimated contribution to global lithium supply:

Kathleen Valley Located in Tier 1 jurisdiction

Australia is the world's most attractive mining jurisdiction due to high levels of political stability, government policy, mineral reserves and commercial operability – there is significant scarcity value in a lithium resource of Kathleen Valley's quality, scale and location

2030 World Lithium Production (kt LCE)

Australia ranks as the most attractive investment location[1] and will continue to be the one of the main suppliers of lithium worldwide



Australia also benefits from significantly faster time to resource production than the global average

Source: IEA World Energy Outlook Special Report, Fraser Institute, UBS Global Commodities & Mining

1. Out of 84 mining jurisdictions surveyed with considerations to mineral potential, regulations, taxation, infrastructure and other policy matters. Investment attractiveness ranking of the most attractive jurisdiction in the country if there are multiple

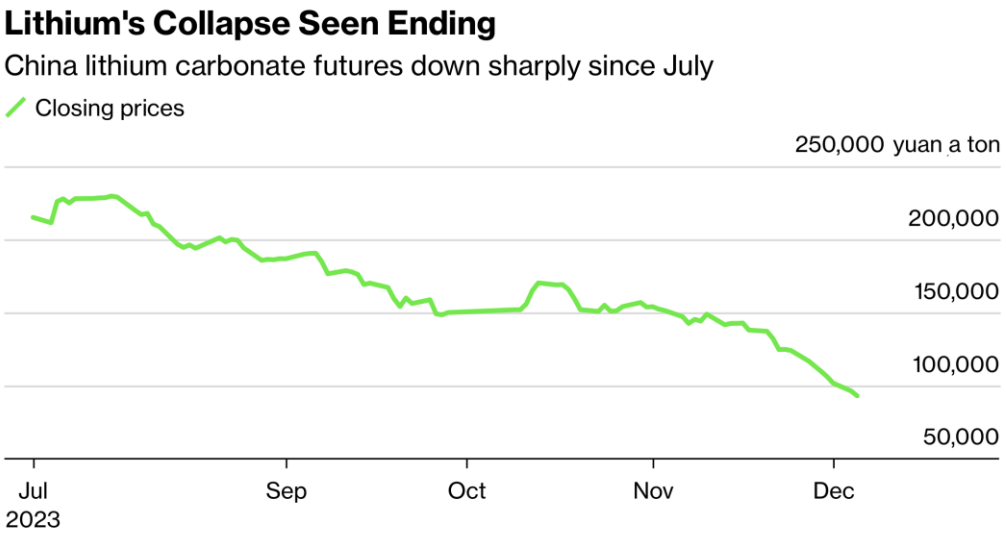
11

The above supply expectation hits 3.17 MT which suggests lithium could remain in oversupply for longer. Not to mention other possible production sited and companies like AVZ, Sayona, Orocobre etc...

Peer Comparison Information – Capital Intensity

Company	Project	Stage	Capital Cost (US$m[1])	Average Annual Spodumene Production (ktpa)	Grade (%)	Capital Intensity[2]	Information Source
Liontown Resources	Kathleen Valley – PFS	Development	237	350	6.0	678	ASX Announcement – Kathleen Valley PFS Presentation, 9 October 2020
	Kathleen Valley – DFS	Development	393	700	6.0	561	ASX Announcement – Kathleen Valley DFS Presentation, 11 November 2021
Critical Elements	Rose	DFS	276	205	5.2[3]	1,341	Website – https://www.cecorp.ca/en/projects/rose-lithium-tantalum/
Sayona	Authier	DFS	97	114	6.0	850	ASX Announcement – Revised Authier DFS Shows Boost to Profitability, 11 November 2019
Orocobre	James Bay	Exploration	244	330	5.6	792	ASX Announcement – James Bay Development Plan, 9 March 2021
AVZ Minerals	Manono	DFS	545	700	6.0	779	ASX Announcement – Capital Raising Presentation, 2 July 2021
Savannah Resources	Mina do Barroso	Exploration	136	175	6.0	777	LSX Announcement – Scoping Study for the Mina do Barroso, 14 June 2018
Firefinch / Ganfeng	Goulamina	Exploration	194	436	6.0	445	ASX Announcement – Goulamina: Confirmed as World Class Deposit, 20 October 2020
Sigma	Grota do Cirilo	Development	143	440	6.0	325	TSX Announcement – Investor Presentation, 8 September 2021

The current estimation as discussed below with Bloomberg, doesn't estimate supply deficits till 2028, thus oversupply, thus prices to remain low or even lower in a recession till 2027 and higher in good times like now.

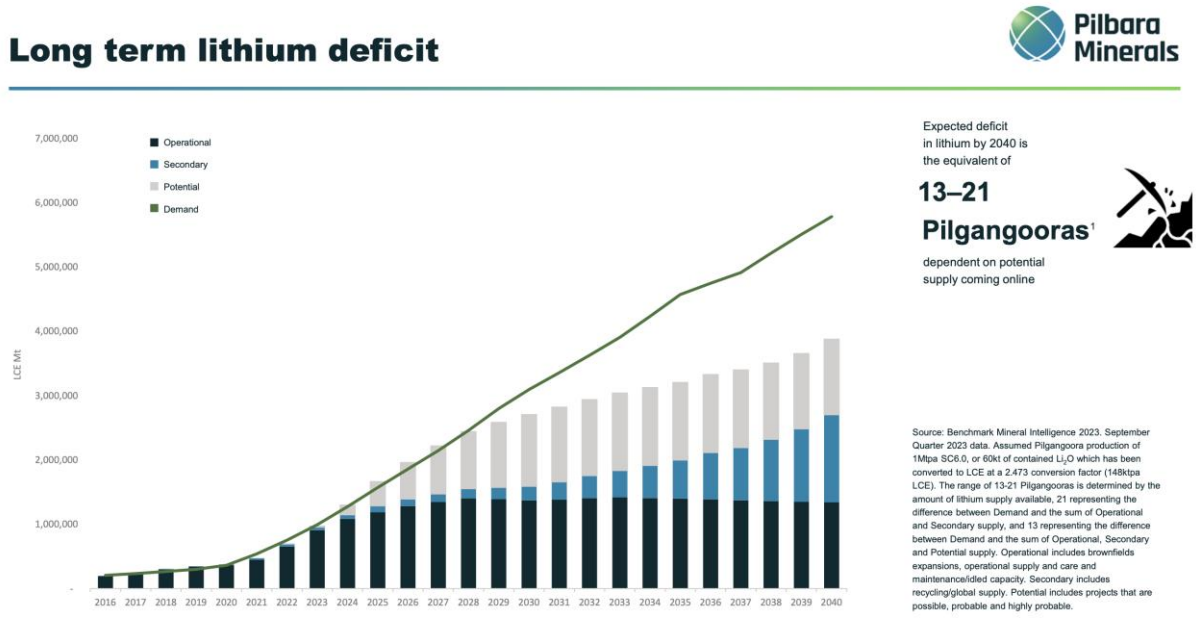


Source: Guangzhou Futures Exchange data compiled by Bloomberg

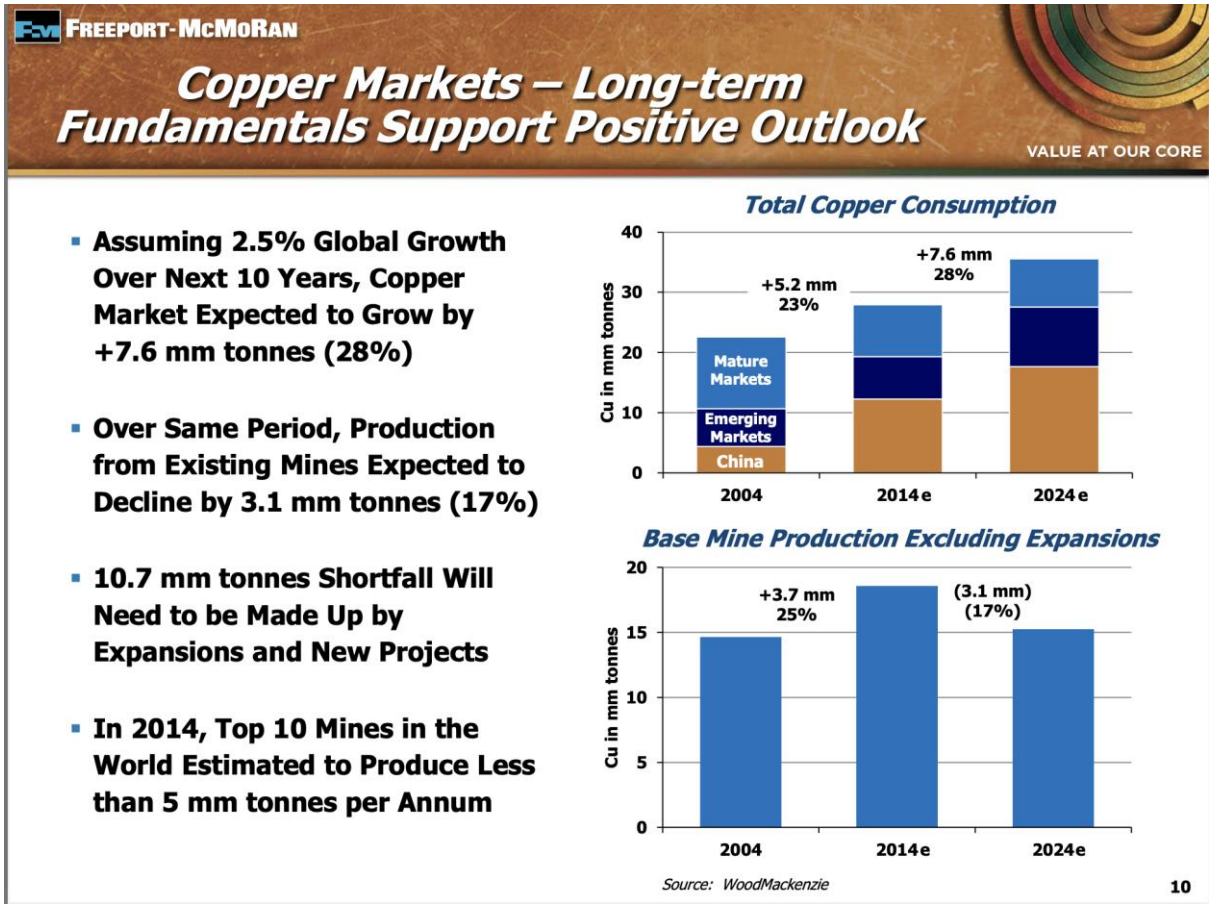
While lithium prices may not go too much lower, a sharp turnaround appears unlikely. A massive expansion in supply and a slowdown in growth rates for EV sales have contributed to the slump, and Benchmark Mineral Intelligence doesn't expect the global market to return to deficit until 2028.

Source: Bloomberg

Given the above, I don't buy the lithium deficit charts published by producers.



I have been looking at a similar chart forecast for copper since 2015 where a huge supply gap had been expected 5 years ahead. 8 Years have passed since 2015 and now the supply gap for copper is still 5 years ahead. This is a 2015 Freeport McMoran presenation estimating a copper supply gap situation by 2024.



Source: [FCX 2015 Presenation]

The real situation is that copper could be in oversupply in 2024 with consumption at 27mmt and far from FCX's2015 forecast of 35mmt with mine production at 15mmt. Mine production in 2024 is expected at 23.8mmt.

World Refined Copper Usage and Supply Forecast

Thousand metric tonnes, copper

REGIONS	COPPER MINE PRODUCTION			REFINED COPPER PRODUCTION			REFINED COPPER USAGE		
('000 t Cu)	2022	2023	2024	2022	2023	2024	2022	2023	2024
Africa	3,274	3,436	3,683	2,183	2,292	2,484	177	184	192
N.America	2,534	2,418	2,590	1,649	1,603	1,690	2,267	2,227	2,264
Latin America	8,556	8,975	9,376	2,580	2,383	2,361	384	384	392
Asean-10	1,078	1,065	1,104	494	461	633	1,182	1,183	1,264
Asia ex Asean/CIS	2,649	2,689	2,938	13,825	14,857	15,742	17,770	18,362	18,845
Asia-CIS	945	969	1,021	515	505	524	107	106	107
EU	782	762	759	2,571	2,507	2,505	3,098	3,039	3,101
Europe Others	1,229	1,242	1,431	1,156	1,305	1,376	845	866	897
Oceania	895	915	935	401	437	465	5	5	5
TOTAL	21,941	22,471	23,836	25,374	26,351	27,779	25,835	26,357	27,066
World adjusted 1/ 2/	21,941	22,360	23,195	25,374	26,329	27,534	25,835	26,357	27,066
% change	3.0%	1.9%	3.7%	1.7%	3.8%	4.6%	2.5%	2.0%	2.7%
World Refined Balance (China apparant usage basis)							**-461**	**-27**	**467**

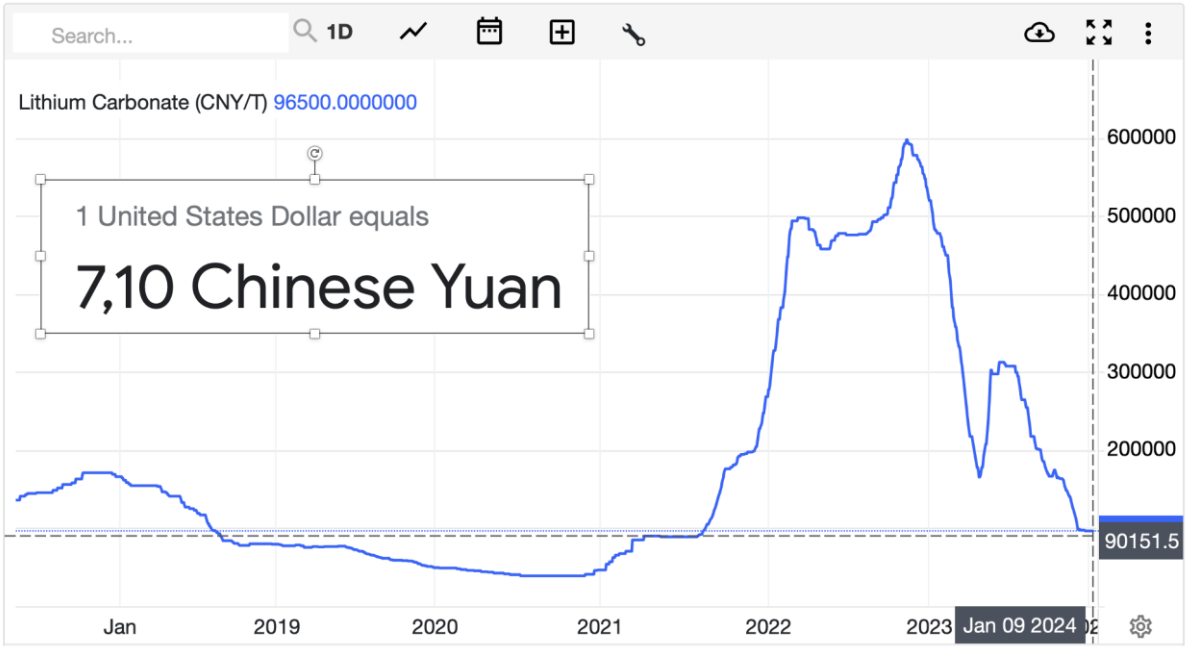
Therefore, take the producer's forecasts with a few pinches of lithium.

Now that we have discussed supply and demand, let's discuss potential lithium prices going forward.

Lithium Pricing Going Forward

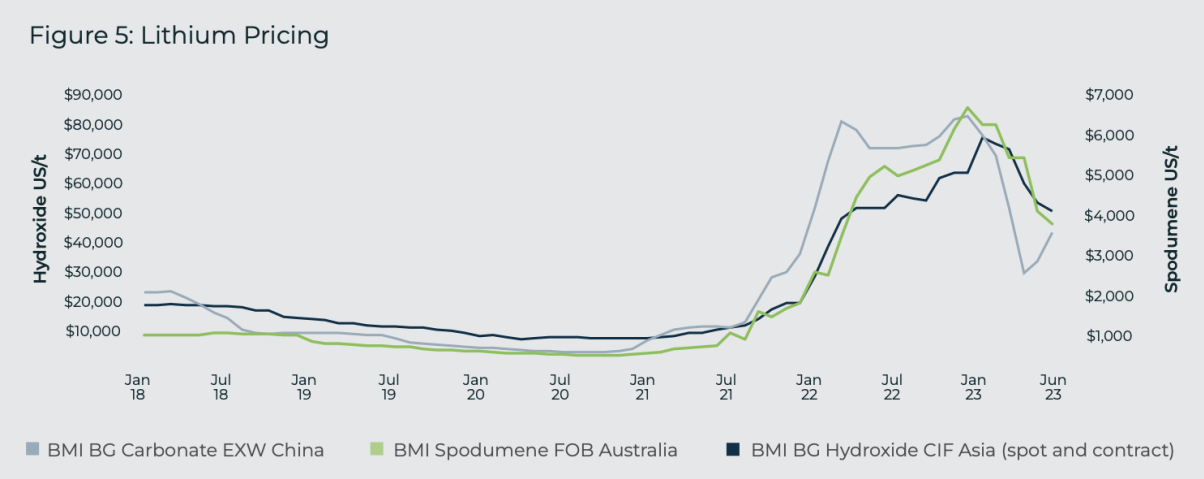
Even with a possible supply gap by 2030, it is very likely we will have oversupply till 2027, and as it doesn't take that long to set up a new mine, the supply gap might never materialize. However, there will certainly be ups and down, which is what we can bank on, but don't expect the above supply gap to ever materialize, expect to make money by buying when others are scared and selling when others are exuberant.

We could say that lithium prices have crashed since the peak at the end of 2023. It is very important to understand that miner's data will still be based on much higher than current lithium prices and the real ugliness of the current situation could be seen only at first after Q1 2024 and then completely as 2024 goes by.

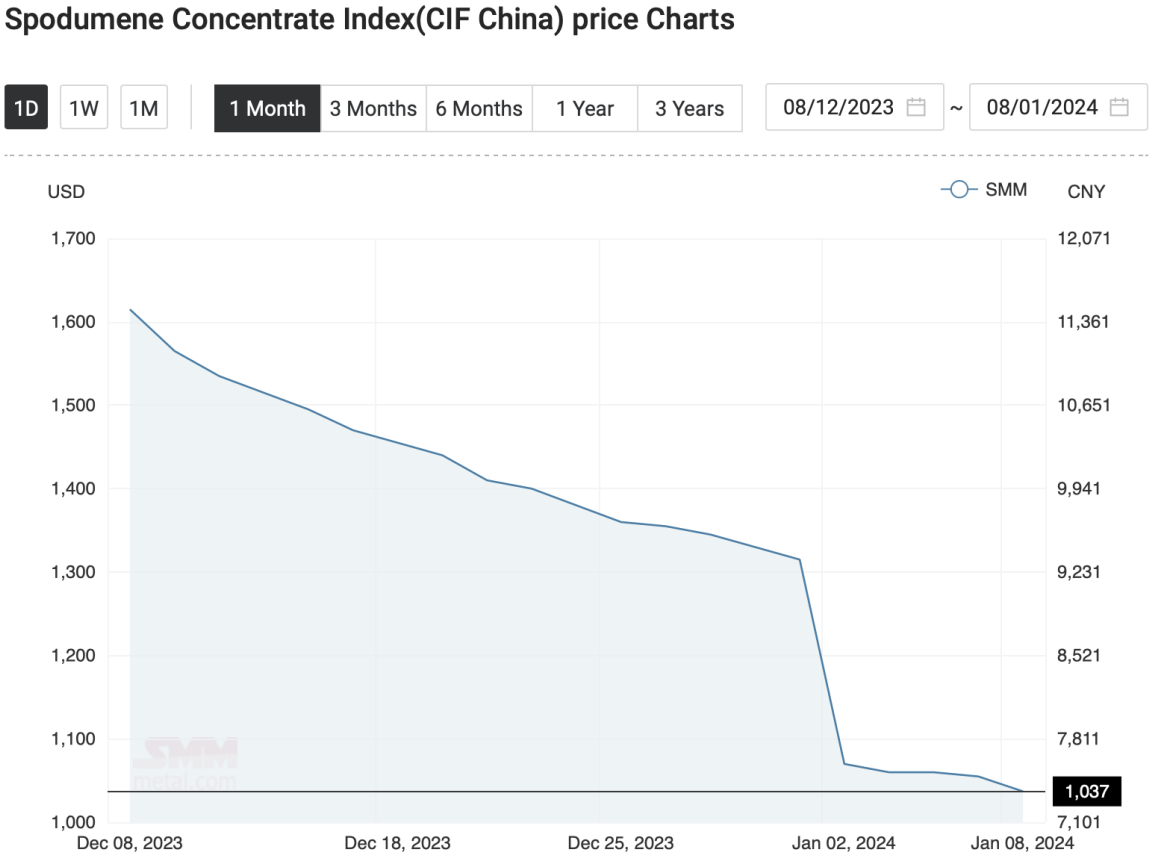


Many of the producers sell spodumene concentrate

Spodumene is usually trading at a bit below 10% of lithium pricing but usually follows lithium prices and is based on the above pricing.

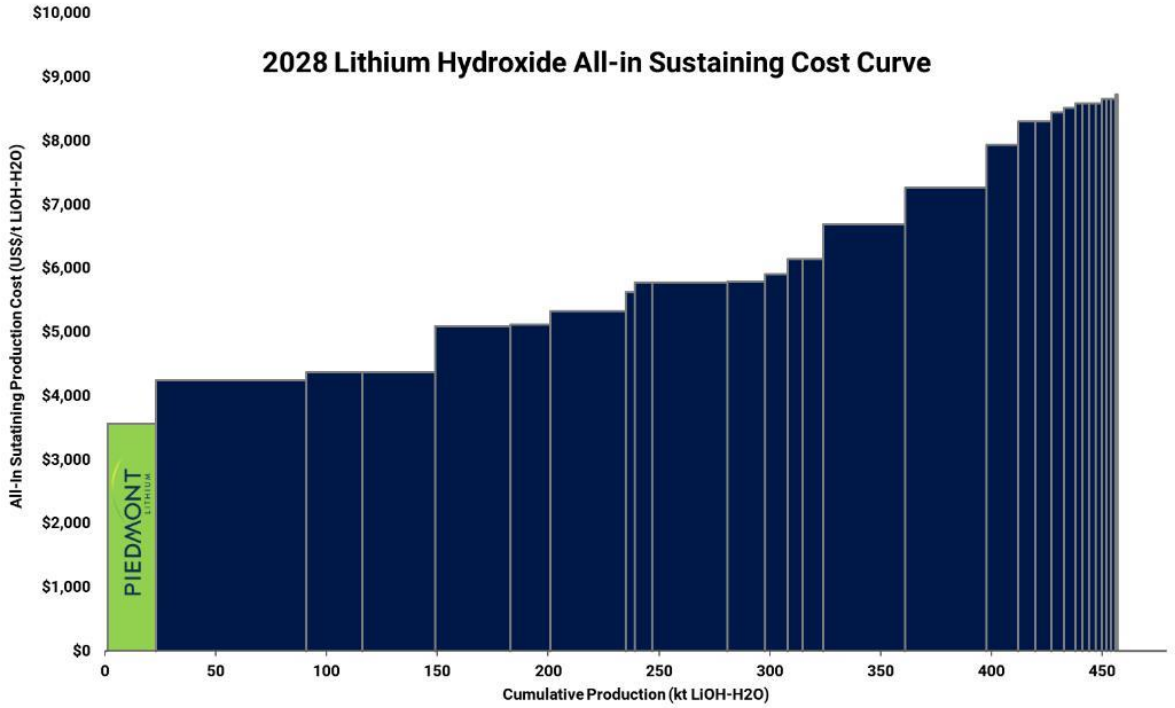


Current spodumene prices are extremely low compared to the huge profits producers made in 2022 and 2023.

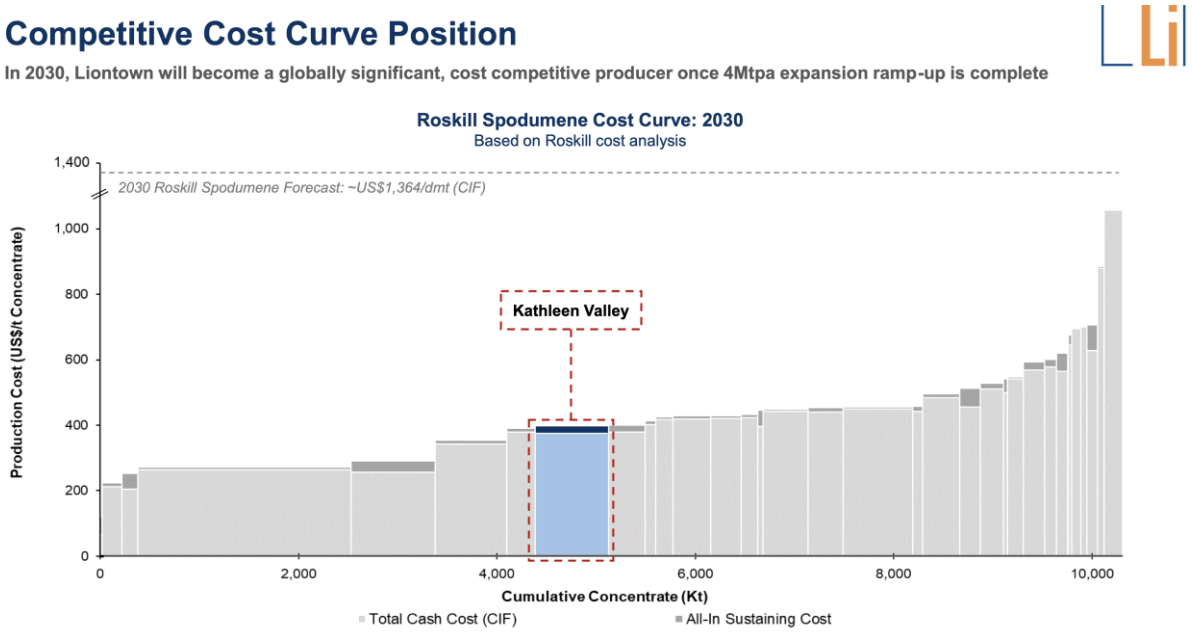


As value investors, to find a margin of safety investment level, we have to look at cost curves. I'll go through a few of such cost curves as estimates are all over the place, but that should give us a good indication of where we could see prices bottom going forward.

Piedmont estimates that the all-in sustaining cost curve for lithium will top at $8,000. To me that means that any investment in lithium above $8,000 is a risky one.

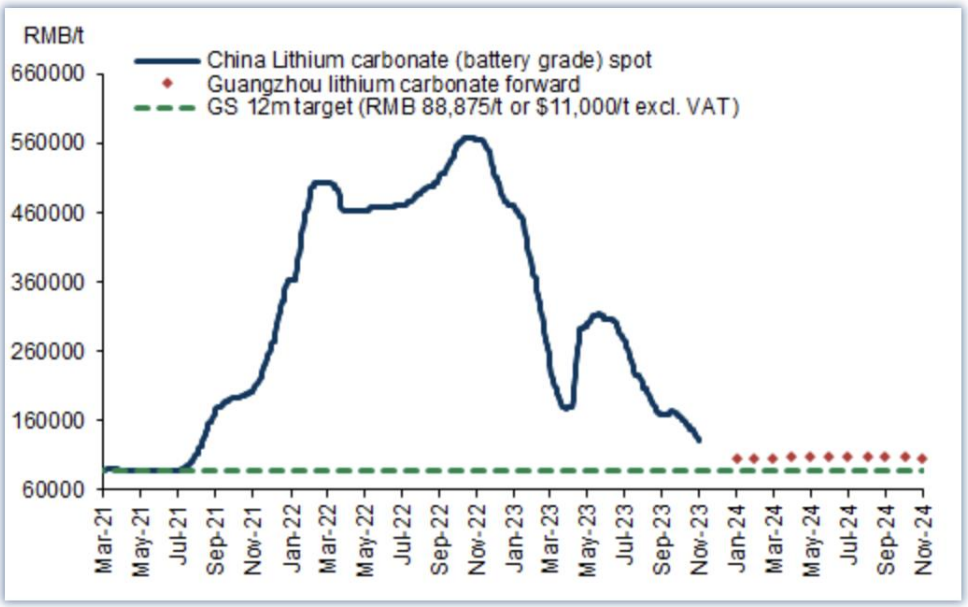


Liontown has a hockey stick cost curve projection for spodumene with high cost producers at just above $1,000 while 80% of production is at around $400. This means that we could easily see spodumene prices below $1,000 for longer, especially if demand isn't there to fill the full 2030 supply balance.



Goldman is an investment bank that is not afraid to put more realistic projections out there and forecasts lower prices for a bit longer, at $11kt deep into 2024.

Exhibit 11 : We continue to expect prices to trade deeply into the cost curve to balance the market...



Source: Goldman Sachs Global Investment Research, SMM, Wind

Given the cost curves shown above, lithium is still priced above production costs and if demand growth isn't equal to the maximum growth exuberance levels, given the wall of supply coming online in the next few years, I would expect lithium prices to be low for the next few years, especially if there is a recession.

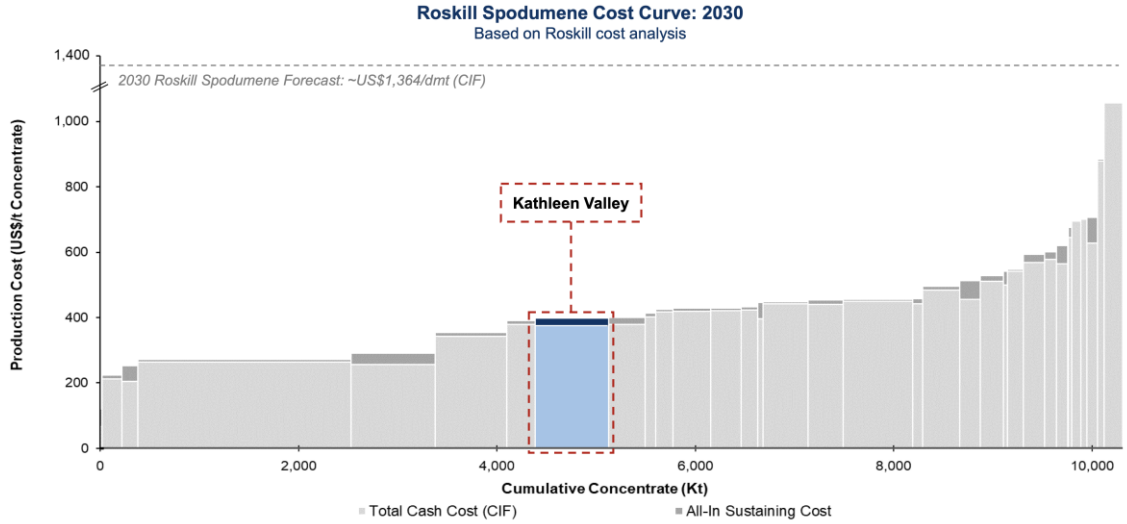
This doesn't mean the opposite can't happen, a few projects could be scrapped (unlikely given the cash miners have made last two years), but you never know, and we could even see another boom in a year or two. For a boom to happen, we just need to have temporary supply deficits.

Further, we could actually see a big supply deficit in 2030, but not because of lithium demand growth and high lithium prices, because of low lithium prices in the next 5 years, that limit investments into new production and exploration, that consequently ends with not enough supply and high prices again - that is how cyclicals work, but first we need the exuberance from the last two years to cool off, and for that to happen we need reality to hit lithium for a year or two and then go bottom fishing.

Anyway, I will be looking into buying lithium miners, all else equal, when lithium prices are below $10k, preferably $8k and spodumene prices are below $800 and that would likely be just a value investing start.

Competitive Cost Curve Position

In 2030, Liontown will become a globally significant, cost competitive producer once 4Mtpa expansion ramp-up is complete



Now, let's check the top miners to see where lie the opportunities for both value and more aggressive investors. There miners that are profitable even with the low lithium prices I mentioned above.

Albemarle Stock NYSE: ALB - They Don't Convince ME

Albemarle is part of the big lithium 3 with SQM and Arcadium.

Albemarle Stock Overview

ALB stock is down 58% from the end of 2022 lithium boom peak but still up from the lows of 2019. Given it is a cyclical growth sector, these fluctuations should be normal and money could be made on the cyclical rebounds.

The PE ratio is below 5 but that is based on high 2023 lithium prices. At current lithium prices 2024 will be ugly and therefore the PE will change. The dividend yield is 1.18% and low likely because of investments in growth. Let's check the business.

Albemarle Business Overview

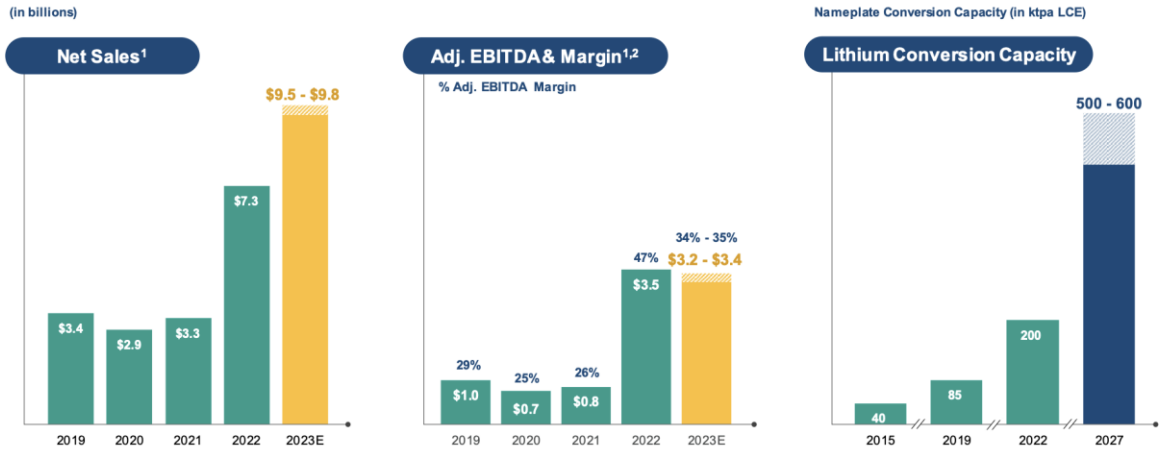
The best way to see what the business is doing and where the focus lies is to look at the latest investor presentation (December 2023).

As most lithium players, Albemarle is also focused on growth by increasing production. They plan to triple capacity by 2027 and they have the cash to do so given the huge profits made in 2022 and 2023. However, if we go back to 2021, assume a similar situation going forward given lower lithium prices, we get to maybe $2 billion of EBITDA by 2027, even after the growth investments. Of course, it will all depend on lithium prices going forward and as discussed above, there are different scenarios there.

We cannot look at the below chart end estimate thing going forward because the 2022 and 2023 revenues were based on lithium prices between $40k and $60k per ton, while current prices are at around $12k. If I multiply the projected 2027 production of 600 kt of lithium with current prices, I get to approximately $7 billion in revenue, which is lower than 2023 with a third of the estimated 2027 production.

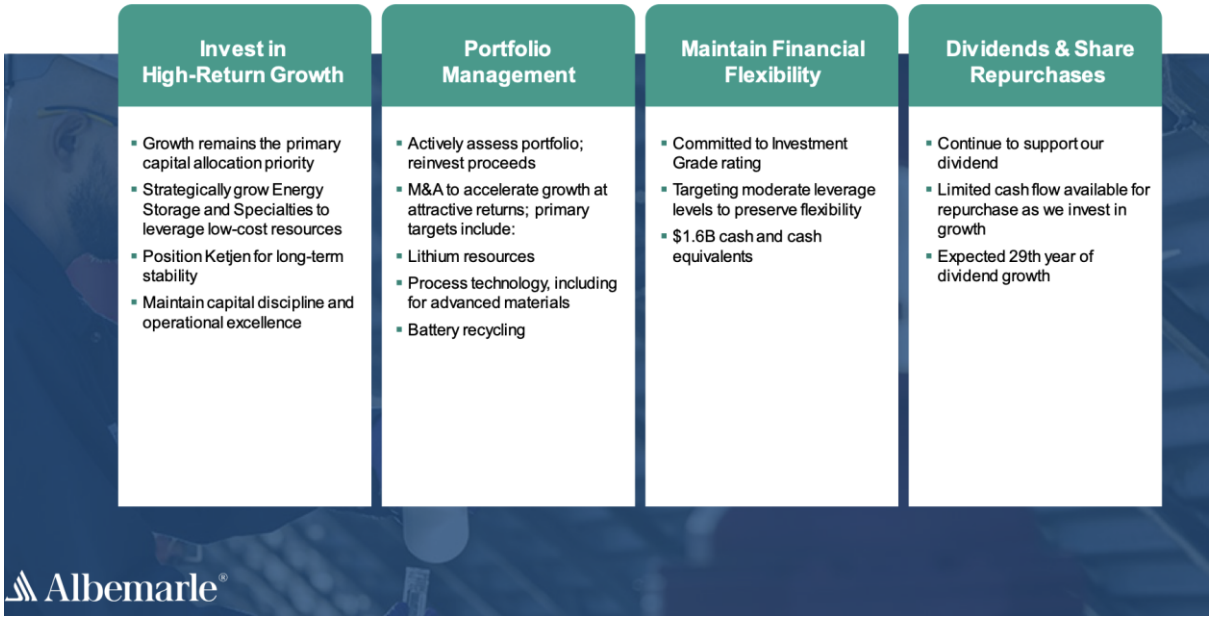
Strong Track Record of Financial and Operating Performance

Deliberate, transformational steps to position for growth

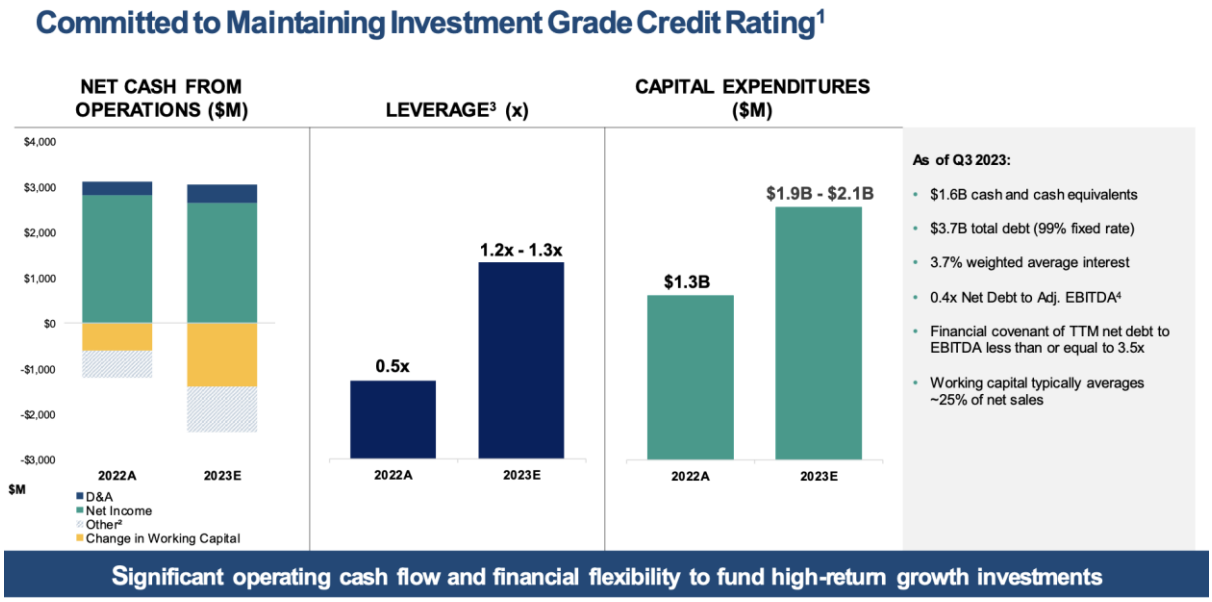


Given the estimated growth in lithium demand and the company's position, the focus in obviously on growth:

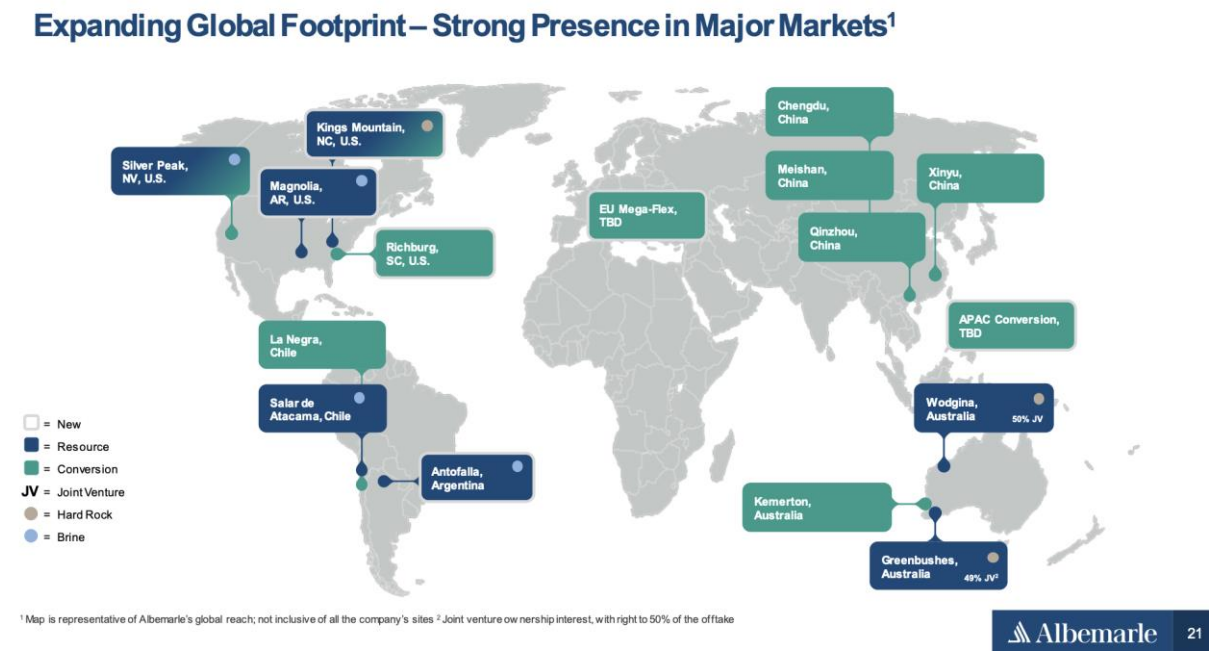
Disciplined Capital Allocation to Support Growth Strategy



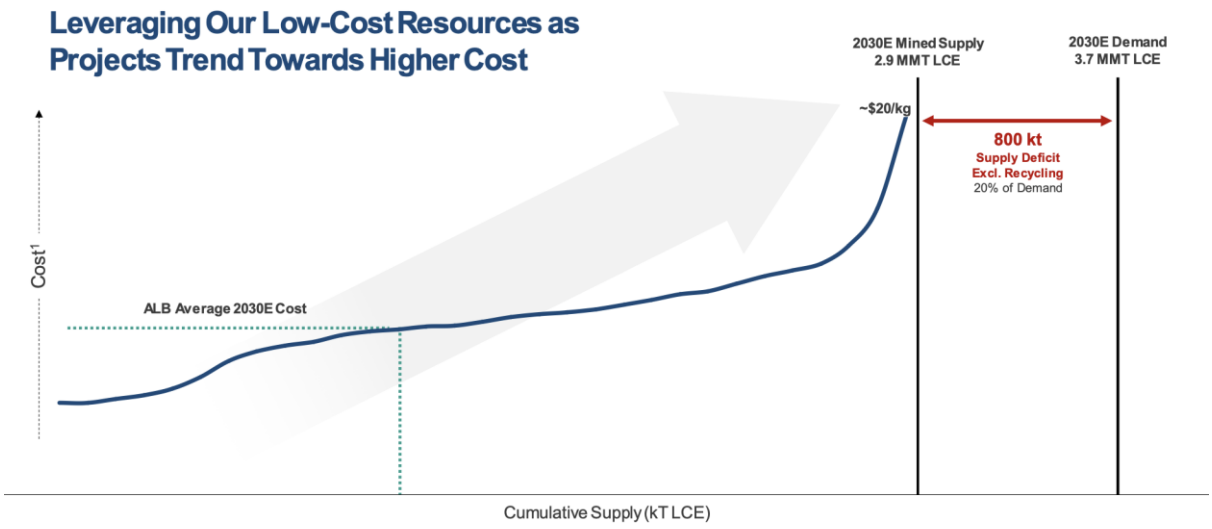
On top of investing all the cash they made, they do even have $3.7 billion in debt which is a significant amount given the cyclicality of lithium prices.



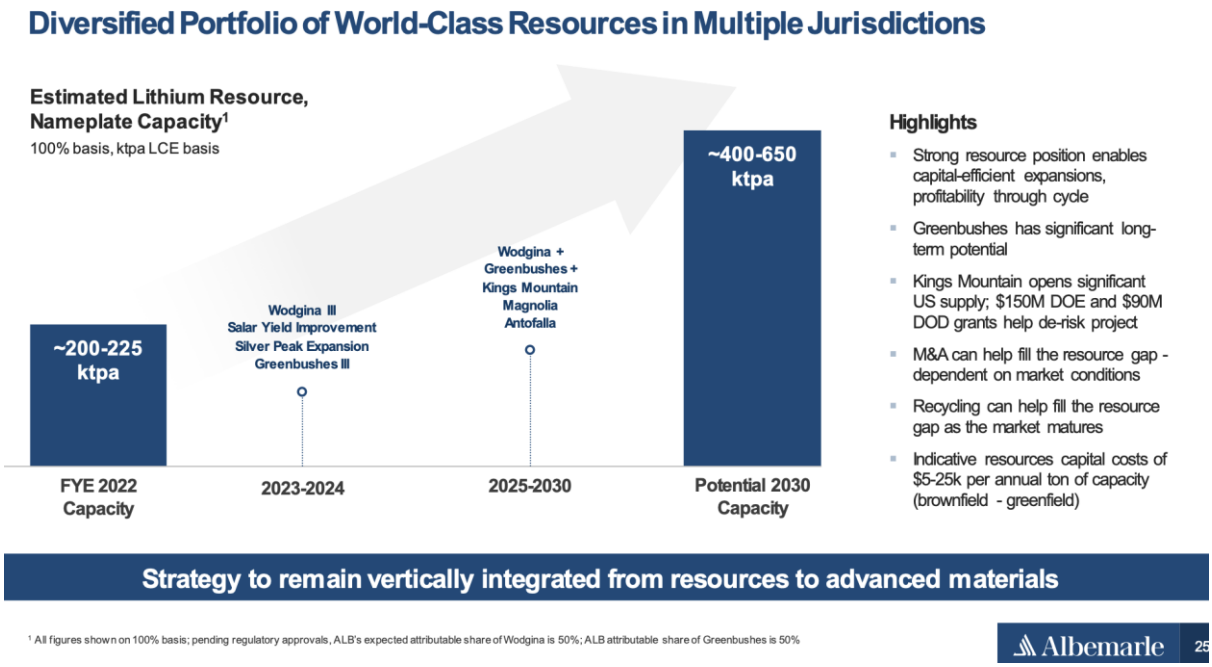
The business is globally diversified:



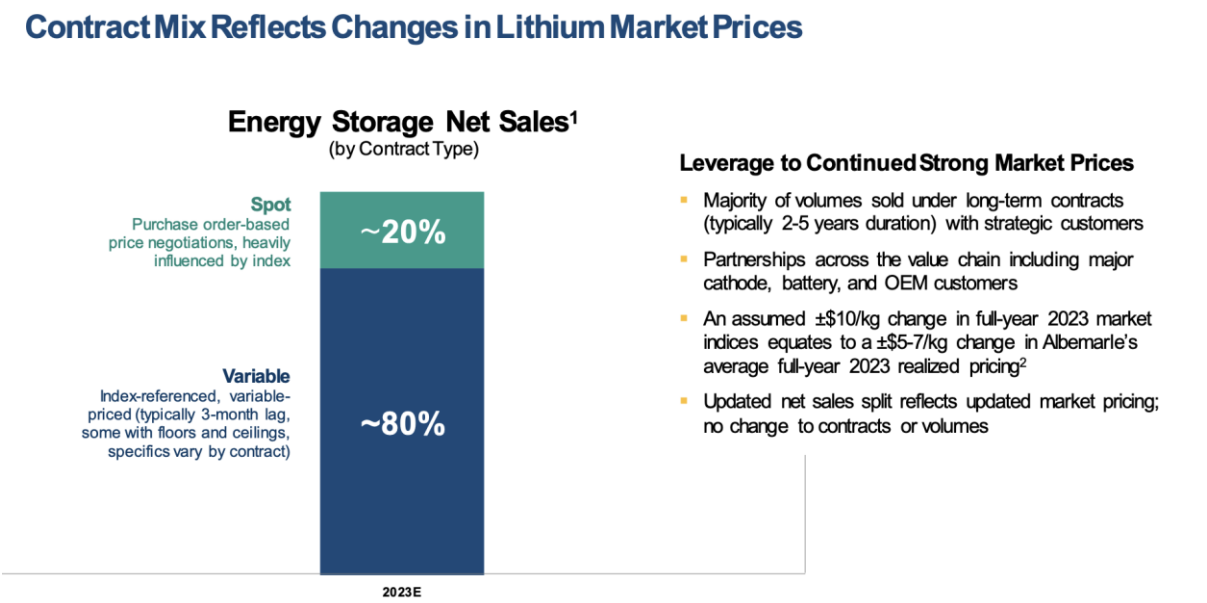
Given its history, Albemarle is among the lowest cost producers, meaning they will be profitable in whatever environment which is helpful, but we have to keep in mind the debt and long-term average profitability.



They plan to expand on their low cost production sites.



For now, most sales are done by contract so Albemarle doesn't gain as much when prices go up, but also doesn't lose as much when prices go down. However, lithium contracts are based on spot prices and the max a company can enjoy is a few months of lag, but prices eventually catch up.

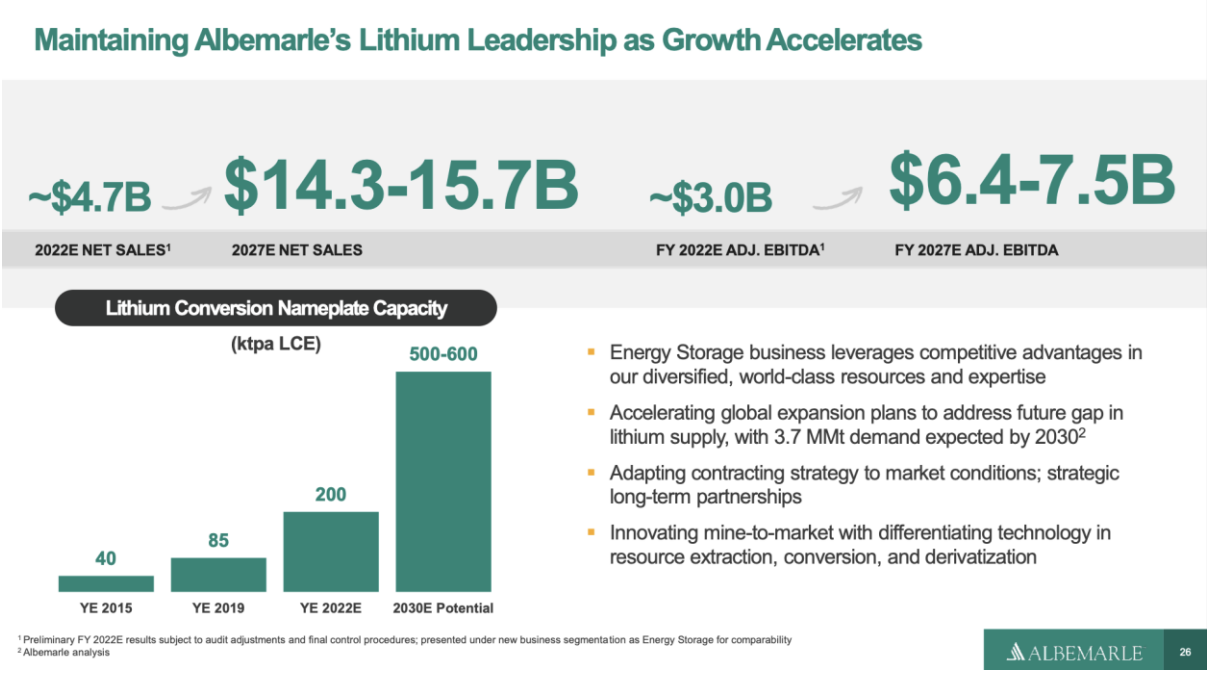


Albemarle Financials

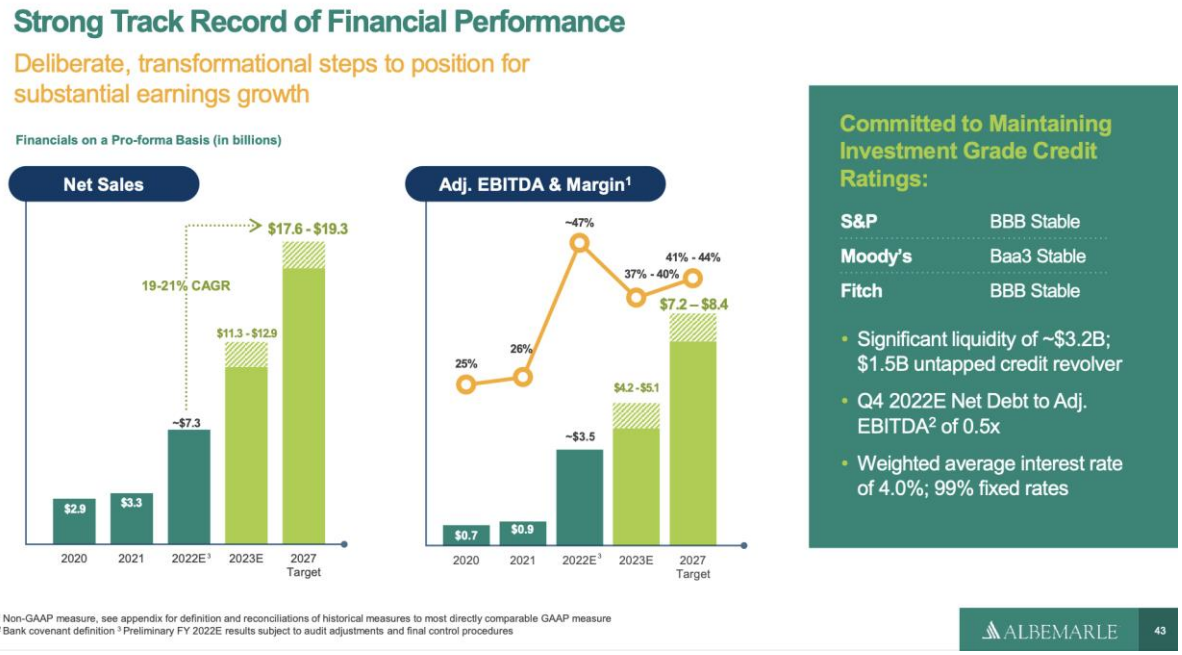
High lithium prices have created an explosion in revenues, but revenues will decline on pricing despite increased production.

Income Statement | TIKR.com	31/12/16	31/12/17	31/12/18	31/12/19	31/12/20	31/12/21	31/12/22	LTM
Revenues	2,677.20	3,071.98	3,374.95	3,589.43	3,128.91	3,327.96	7,320.10	9,882.02

It is funny to look at their very exuberant predictions from January 2023 when it looked like the sky is the limit for lithium prices (Albemarle strategic presentation Jan 2023):



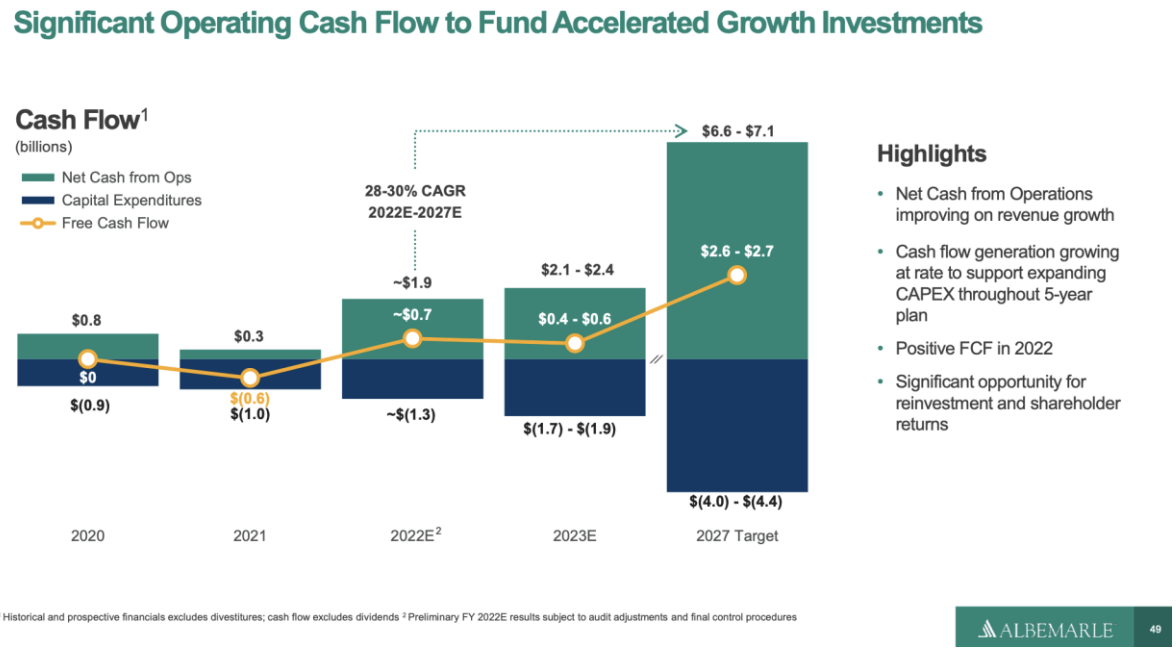
The above projections show the inexperience and trend impact of lithium miners. You never see guidance in currency, only in production estimates with other miners. We all know it is impossible to predict commodity prices and therefore the above was a very bold projection. Of course, already by the end of 2023 the market corrected everything.



With the growth in production to 600k capacity, net sales get to $9 billion, not $18 billion, thus EBITDA is not $8 billion but there is no EBITDA or very low.

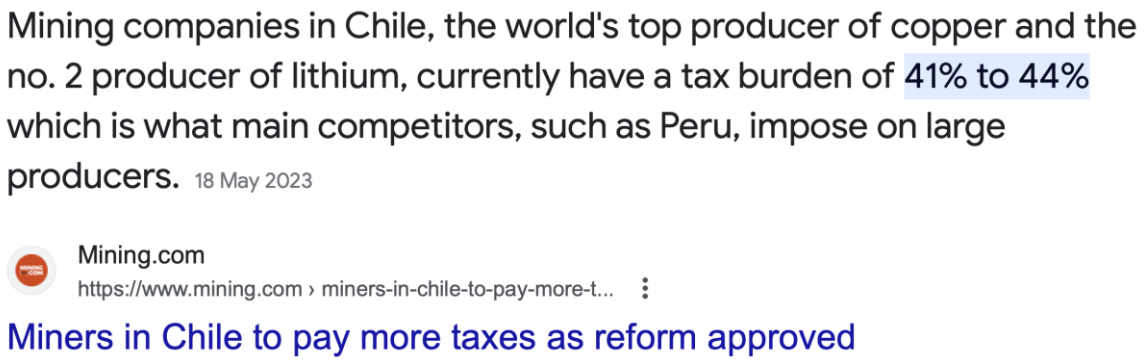
On the other hand, low EBITDA means they will not develop the costlier projects and thus supply will be lower, thus we might have another supply gap down the road and see lithium prices spike again, and then the company could make a lot of money, again. Given it takes from 2 to 5 years to bring a project to production, that is also likely to be the length of the cycle.

Anyway, the company plans to keep investing, likely a bit lower than thought in 2023 but there won't be much cash for shareholders here.



To have a more realistic projection, a margin of safety valuation, I have to cut their growth in half, and then adjust prices and sales.

Let me assume they double production to 400kt, sell at $13k per ton, I get to $5.2 billion in sales which should lead to EBITDA of $2 billion given their low cost production. And EBITDA is before taxes while taxes are huge in Chile.



Not to mention nationalization plans there:

In April, President Boric announced plans to nationalise the country's lithium industry. Credit: Sebastián Vivallo Oñate/Agencia Makro via Getty Images.

Legislators in Chile's lower house of Congress on Wednesday gave final approval for a much-anticipated mining tax reform. It now requires just the signature of the country's President Gabriel Boric to come into law, *Reuters* reports.

Boric has already publicly endorsed the reform, which will require large copper and lithium producers operating in the country to pay more taxes and royalties to the government. Lawmakers approved modifications to the bill by a majority vote of 101 to 24. Last week, the Senate moved to endorse the reform.

"With this legislation, we seek to avoid what happened many times with our country's natural riches: they were exploited, they disappeared, which left very little for the country and its future development," Chilean finance minister Mario Marcel told reporters after the vote.

The new legislation will raise the top tax rate to almost 47% for companies that produce more than 80,000 tonnes of fine copper per year. It also adds a 1% ad valorem tax on copper sales from companies that sell over 50,000 tonnes of fine copper, and an 8%-26% tax, depending on the producer's operating margin.

Unlike SQM with 2030, ALB's concessions in Chile last till 2042 so that isn't an urgent thing, and the global diversification with the great assets in Australia helps.

Further reading on FITCH:

FITCH WIRE

Chile's National Lithium Strategy Could Benefit Incumbent Market Players

Wed 09 Aug, 2023 - 08:53 ET

Fitch Ratings-Santiago/New York-09 August 2023: Fitch Ratings expects the Chilean government's plan to create lithium focused public-private partnerships under the National Lithium Strategy (NLS) to be 'neutral' to 'positive' for the credit profiles of incumbent players in Chile. We anticipate the NLS will not provide the intended boost to the lithium industry, given that private companies are unlikely to invest significant capital to develop lithium projects through state-controlled consortiums.

President Gabriel Boric announced the country's NLS earlier this year, which provides for the creation of public-private joint ventures for lithium production controlled by the state through the copper giant, Corporacion Nacional del Cobre de Chile (Codelco; A-/Stable). The NLS is a material, holistic reorganization of the existing public-private agreement on lithium production but not a nationalization as lithium has been reserved to the State since the mineral was declared non-concessionable in 1979. This new strategy must be approved by Congress and will likely undergo several changes before becoming law.

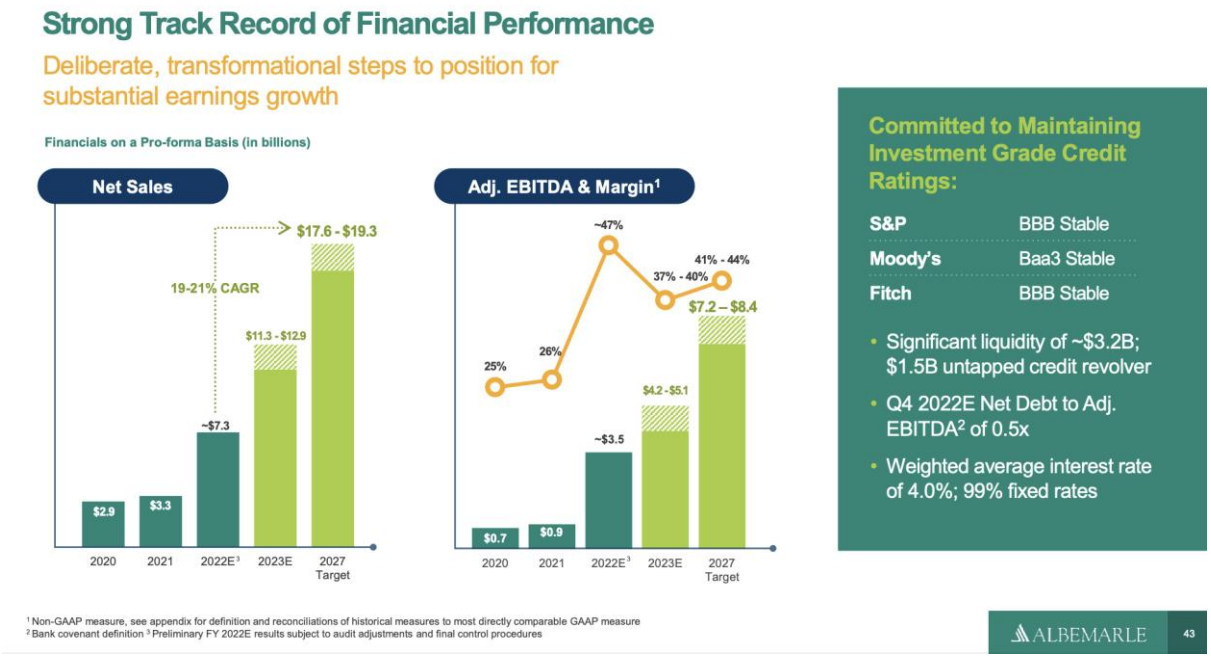
The Chilean government currently has agreements with two private companies: Sociedad Quimica y Minera de Chile (SQM; only national scale ratings at AA[cl]/Stable) and Albemarle (BBB/Stable) through leasing contracts that allow them to extract and produce lithium chemicals from the Salar de Atacama (Salar), the lowest cost production asset globally. The contracts define a maximum amount of mineral to be extracted until their maturity; SQM's contract expires in 2030, while Albemarle's expires in 2043.

Now, the above might be bad for lithium producers in Chile, but good for the industry as new investments might be lower then initially planned. You got to love a cyclical industry :-)

Albemarle Investing Risk And Reward

Mkt cap	15,69B	52-wk high	293,01
P/E ratio	4,74	52-wk low	112,00
Div yield	1,20%		

Yes, if they hit their targets with EBITDA at $8 billion, the market cap could to $64 billion as miners often have a price to EBITDA ratio between 5 and 12. That would be a 4x on the current market capitalization.



However, given the low lithium prices, lower cash creation, high taxes, high investments, they will at best make $2 to $3 billion in FCF which would give us a market capitalization of $30 billion at best.

Worst case scenario, if lithium prices stay low, we can forget about cash production here for a few years here, and get back to a valuation based on my initial conservative estimates and EBITDA between $1 and $3 billion, leading to a market capitalization between $8 billion and $30 billion around the shorter term cycles.

At the current level of $15 billion this is not an attractive risk and reward. Not to mention the $4 billion in debt that they have which is a burden no matter what.

If I check EPS estimates for Albemarle, those are all over the place as it is impossible to know now where will lithium prices be in 2025.

Fiscal Period Ending	EPS Estimate	YoY Growth	Forward PE	Low	High
Dec 2023	21.79	-0.76%	6.24	20.53	23.11
Dec 2024	12.59	-42.22%	10.79	6.00	23.61
Dec 2025	18.46	46.60%	7.36	6.27	44.02

If EPS is $6 like the lowest estimate suggests, Albemarle stock is extremely overvalued while if EPS is $44 as the most exuberant estimation suggests, it is cheap.

Additional note:

I find Albemarle's reports extremely unprofessional, and it seems they are drinking their own Kool-Aid regarding to lithium exuberance. First, normal miners, never give out guidance in currency, but only in production measures as you cannot know future commodity prices.

Also, I miss a management discussion related to production issues and other as the focus is only on how much money they made in 2022 and 2023 and how much will they make in 2027.

My conclusion is that Albemarle is a risky bet that might work well if there is another boom in lithium prices, but if there is not boom, 50% or more below current levels would not surprise me.

If I had to say something about the short term, if lithium prices remain lower in 2024 and 2025, ALB stock might bottom somewhere in 2025 on bad earnings, which might be the best time to bet on a 2028 upside.

It seems that the market is still high on 2022/2023 and not believing the cycle downturn will could last longer.

SQM Stock Analysis NYSE: SQM - huge government uncertainty

SQM is from Chile, where there is a high dividend tax and other taxes, something to keep in mind.

SQM Stock Price Overview

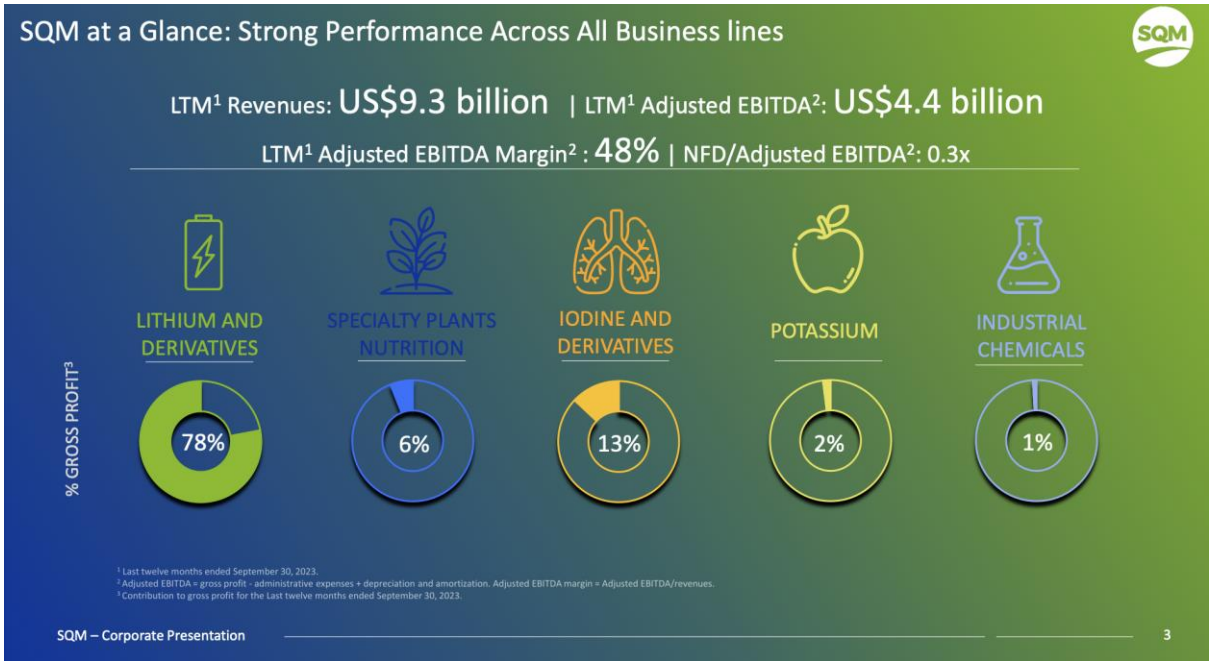
SQM stock is down as all lithium stocks. The PE ratio is low at 5 given the great last twelve months but I don't think it will stay that low for the next 12 months. Market capitalization is $15 billion.

SQM Business Overview

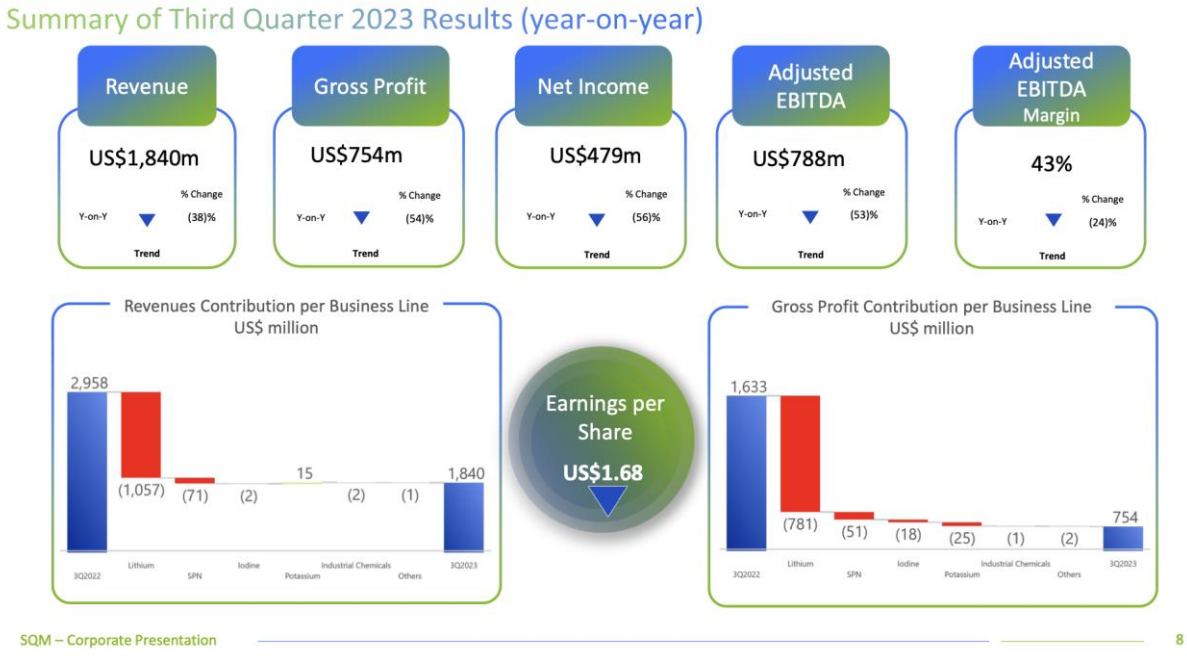
SQM or Sociedad Química y Minera de Chile is a diversified producer of various chemicals.

[SQM Corporate Presentation]

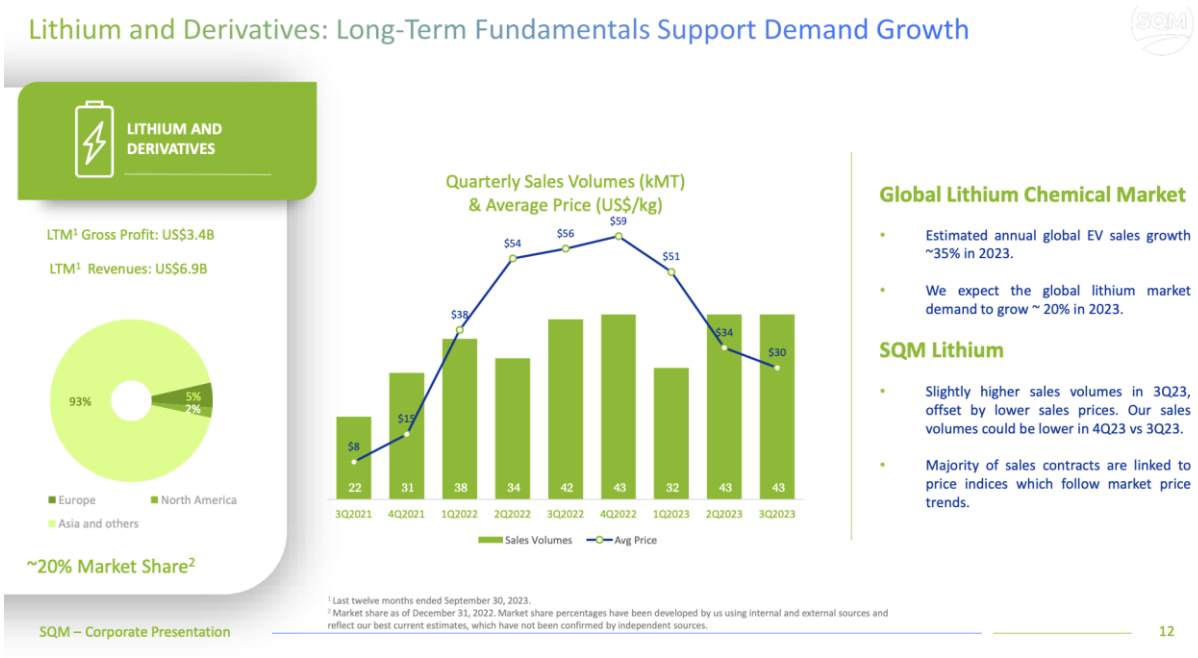
However, given the high lithium prices, lithium did make 78% of EBITDA the last 12 months, but that will change.



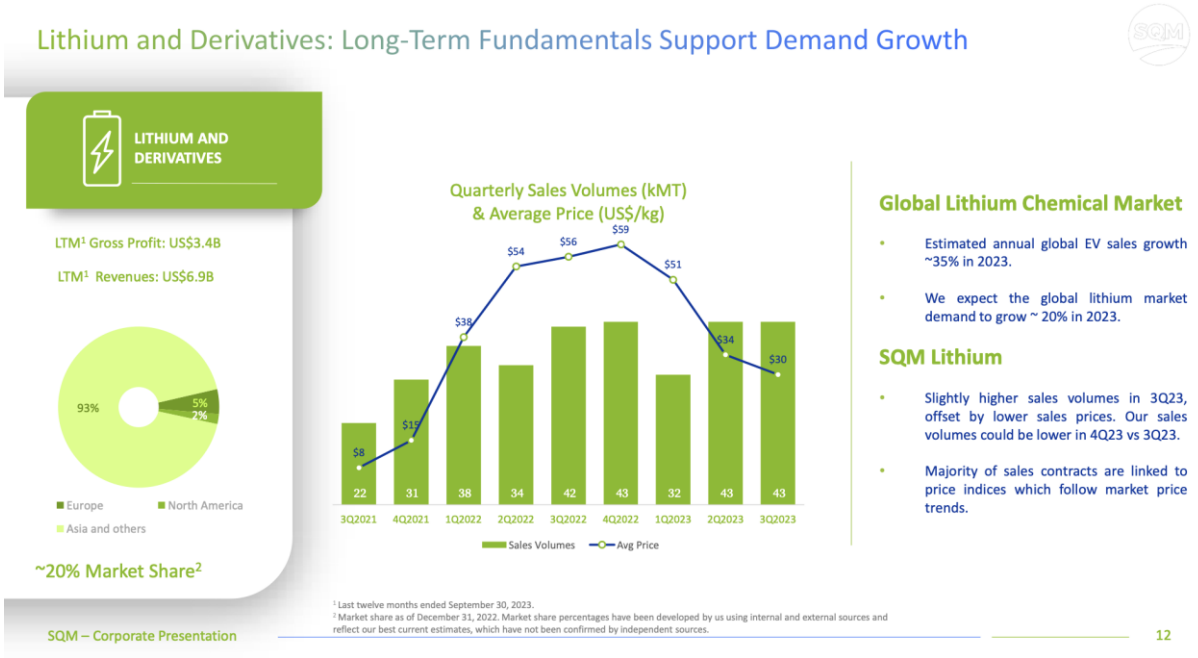
And as lithium prices drop, so does everything on the financial side.



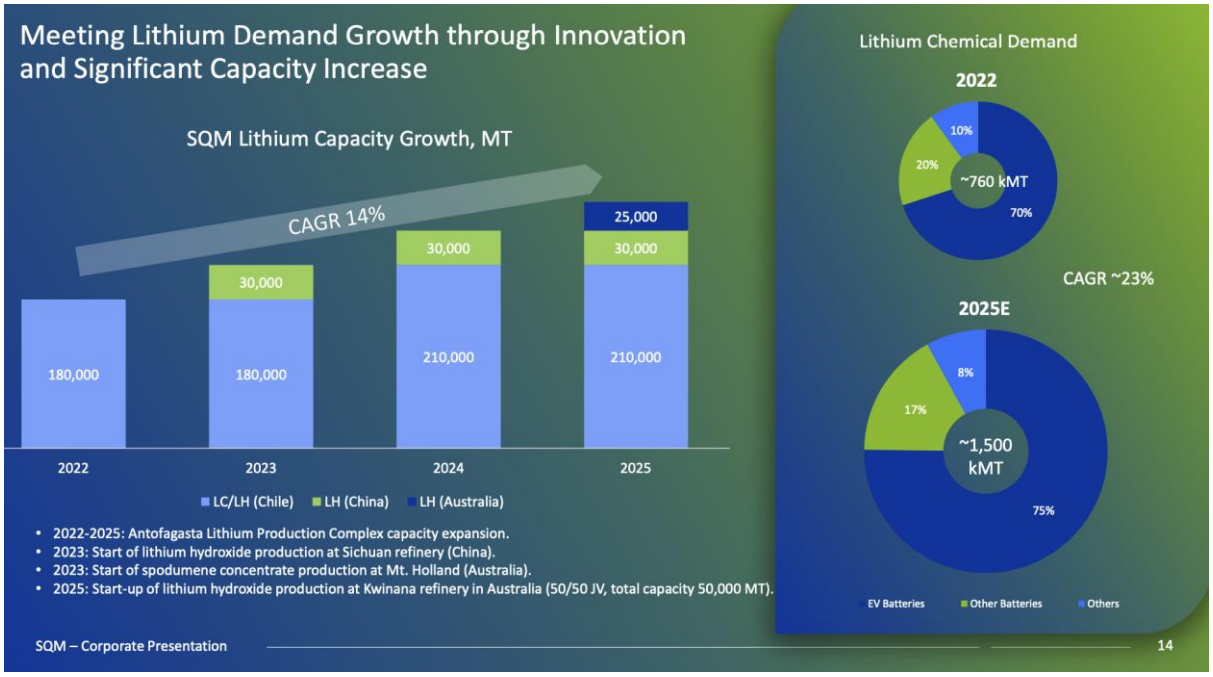
If lithium prices go back to $15 from the current $30 of SQM's last quarter, revenues should half again, and gross profit could go closer zero.



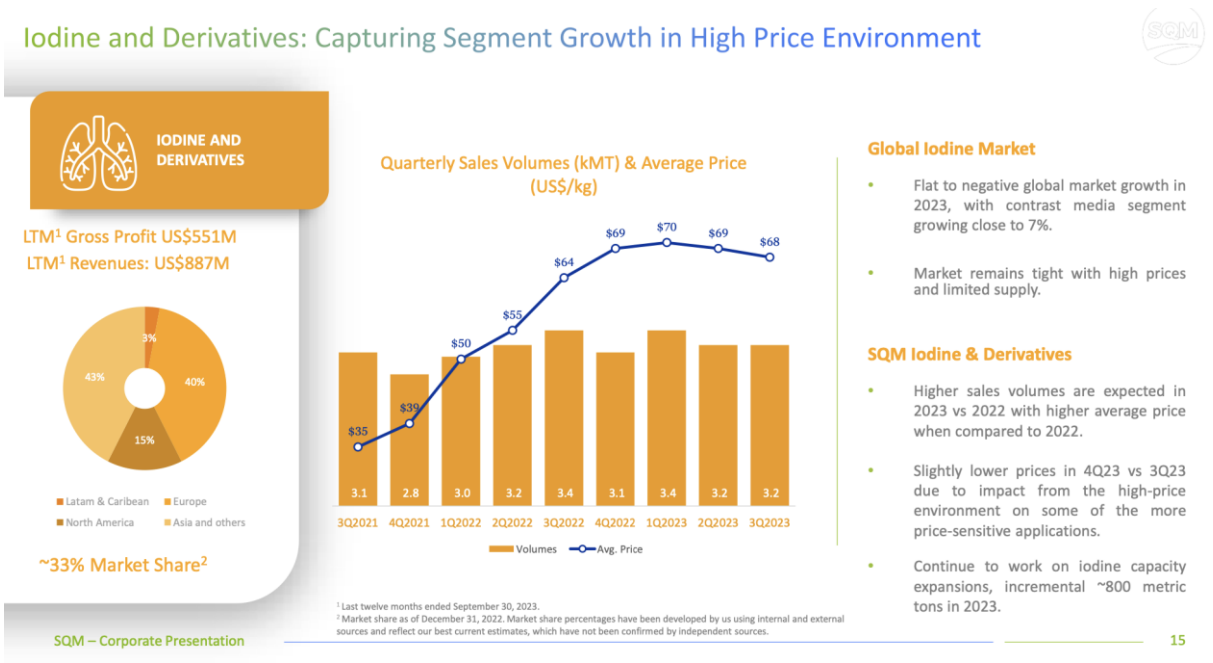
Or, not to be that negative, given the low cost, declining taxes on lower sales prices, they should end up with $1 billion in profits.



They plan for some growth, but not that much as there is no point in investing if you will be left with little after 2030.



Iodine prices have also jumped, but that might also be related to supply chains over the last two years:



it is added to the salt we eat but usage is mostly industrial and pharmaceutical. Nutrition, potassium and other are smaller parts of the company, not that significant for valuation.

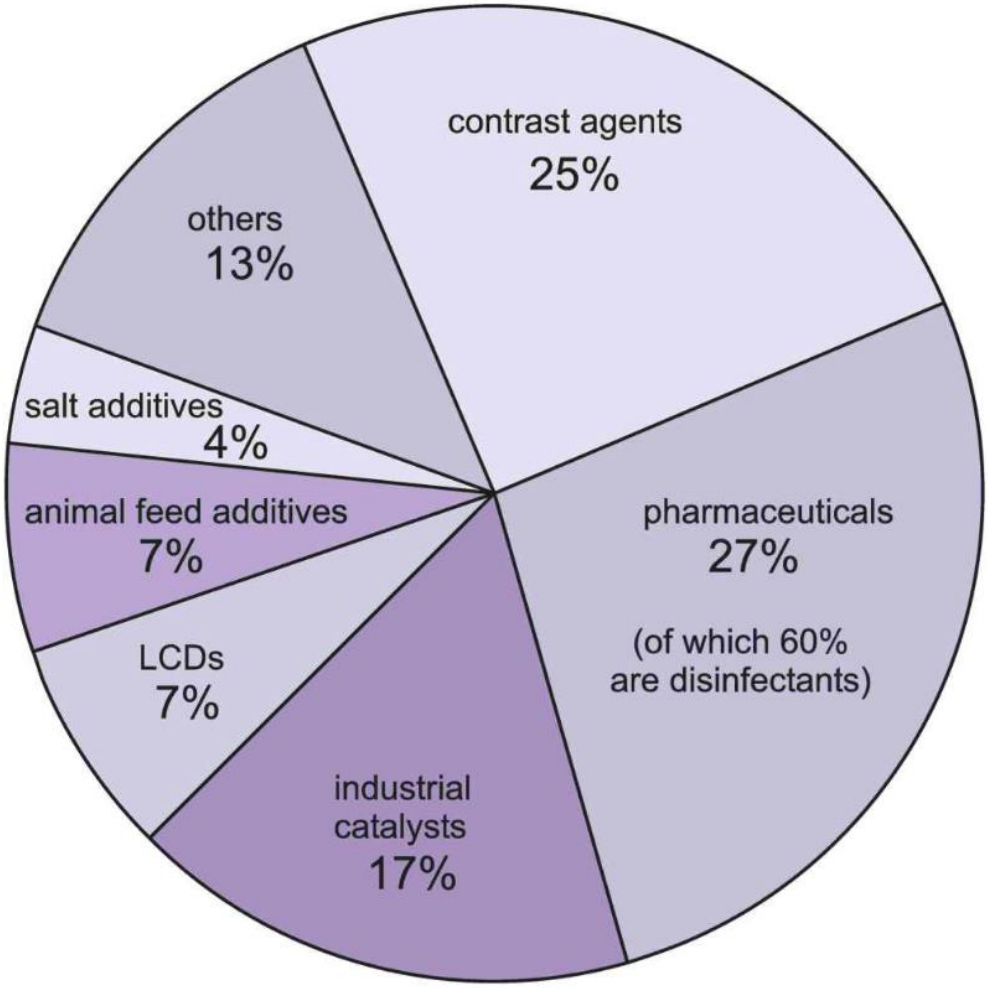
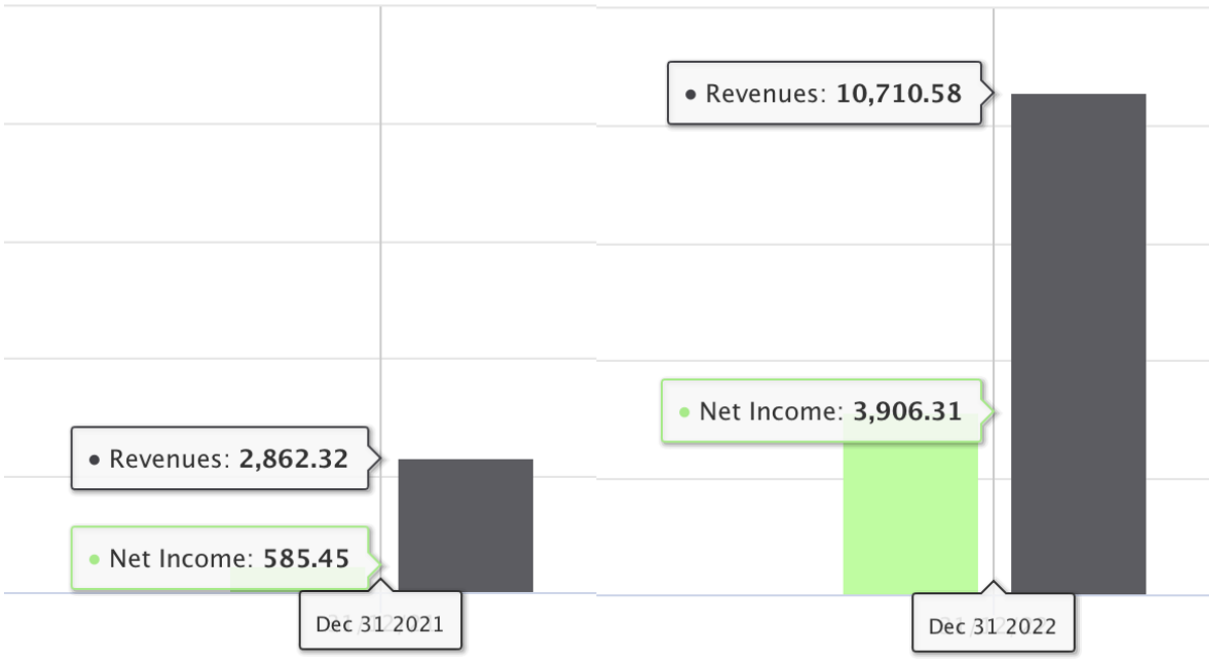


Figure 1 The uses of iodine.

SQM Financials

I don't think the situation can go back to 2021, but $5 billion in revenues should be a good average.



That should give profits of around $1 billion, which puts SQM at fairly valued with a $15 billion market cap.

But anyway, the key here is that their concessions expire in 2030. Codelco, the Chilean government company will be the concession owner going forward and SQM will get some value through a formation of a NewCo.

We don't know yet what will the agreement be, I just know that in Chile, things can change. According to the last news, SQM will get a share in the NewCo for its infrastructure already built, and knowhow, but less than 50%. Government involvement is always a risk, especially if prices go lower. What is certain is that SQM's concessions expire in 2030 and that Codelco will own at least 51% of growth ahead. Hm...

When I see such government involvement, it is simply too risky, despite the attractive dividend, that will be cut for sure. From what I can understand from the latest memorandum agreement with Codelco, that will own the concessions from 2030 onward, SQM is in a position where it can only hope to get some value going forward based on the previous investments and knowledge. What will be SQM stake in the NewCo that will manage things from 2030 onward will be likely known only in 2025. Don't forget, NewCo or not, the huge taxes remain, alongside the majority government ownership going forward. Too risky...

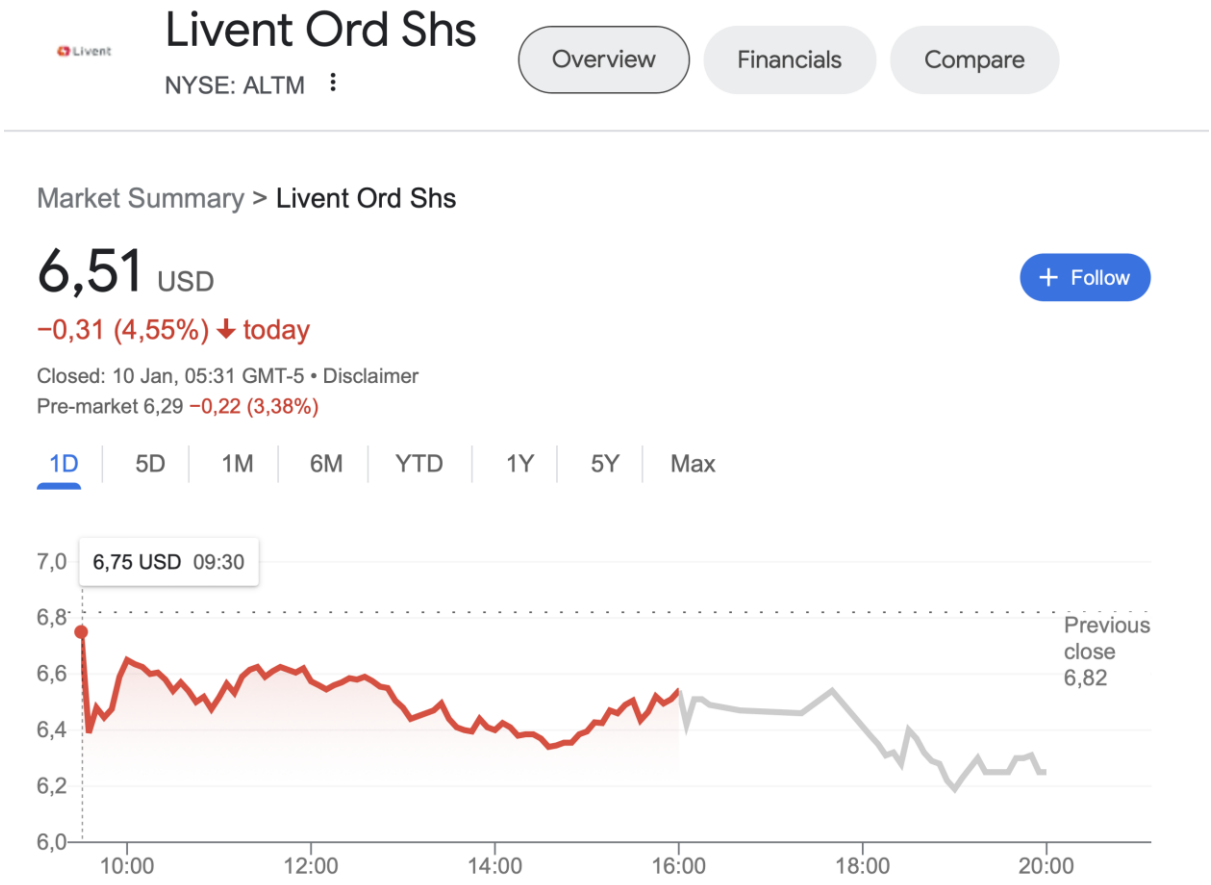
Not to forget the 35% Chile dividend tax etc.... Uh, too hard pile for me.

Arcadium Lithium NYSE: ALTM (Livent + Allkem)

Livent and Allkem just recently merged.

Arcadium Lithium Stock

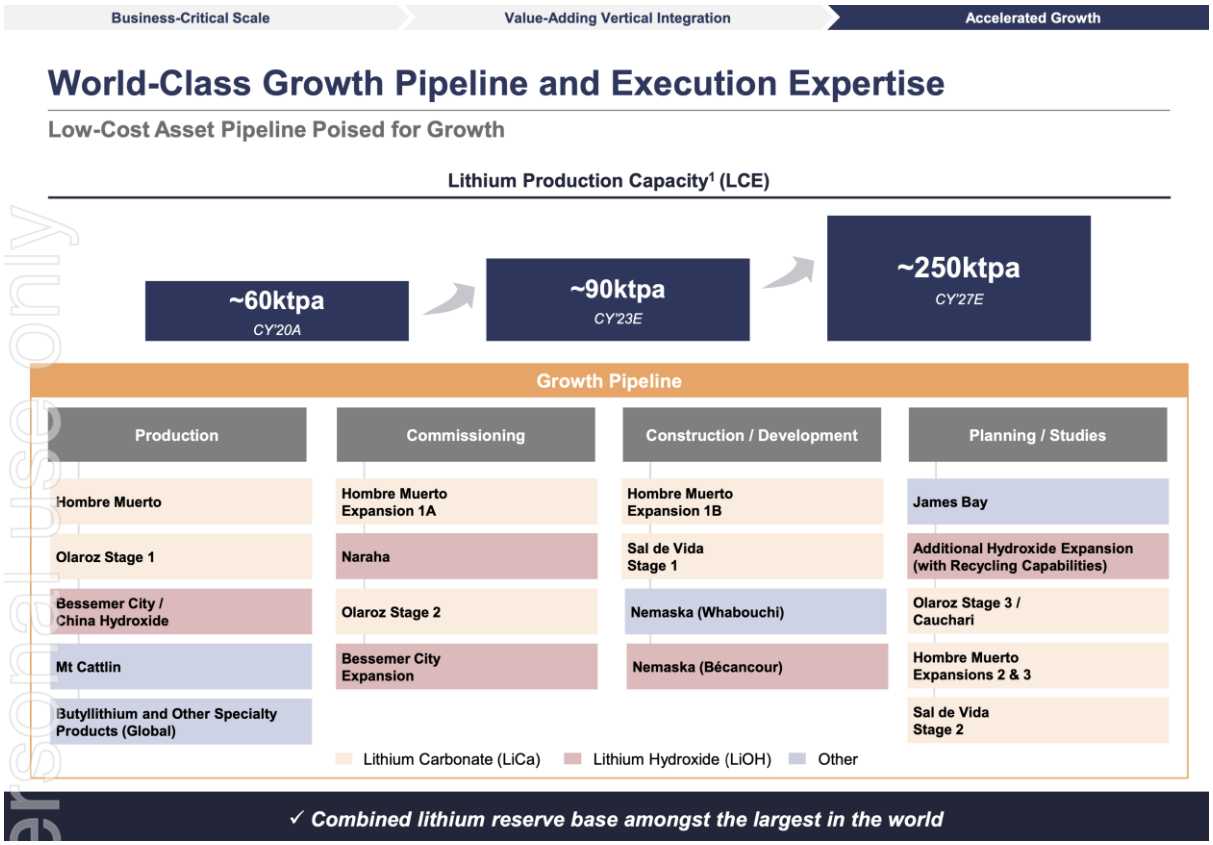
For reference, Livent shareholders received 2.406 Arcadium Lithium NYSE listed ordinary shares for each Livent share held. Thus $6.81 = $16.38 for Livent's stock price.



Arcadium Lithium will have approximately 1,074 million ordinary shares outstanding upon closing. Market capitalization now around $6.5 billion.

Arcadium Lithium Business Overview

From their combined presentation, we can expect 3x growth in production by 2027.



250kt at $13000 is $3.25 billion in revenues for likely $500 million in clean profits that will not be distributed in dividends as they will have to issue debt to grow production till 2027 given the low lithium prices.

Of course, if lithium prices spike to $26k, that would lead to profits of $2 billion, where the market capitalization would then go to $20 billion or something like that for a 3x.

If they make $500 million in profit in 2027, that is still not bad given the current market capitalization of around $7 billion. If then make $2 billion, that could lead to a great return.

I will update more here when we have the first full year 2023 combined results in a few months. if the combined things has long-term promise but temporarily lithium prices look bad, it could be interesting. But given the $0.5 average long-term profits, I would need the stock price to be where it was a few months ago to make it interesting.

Under $5 billion this becomes and interesting play, let's see how lithium prices and lithium miner financials evolve over 2024.

Ganfeng Lithium

not investable for me, but just to have it as an indication.

Global assets:

Lithium Resources Developments

Mount Marion

Spodumene

Ganfeng holds 50% equity interests at project level. Project based in Australia. The current total capacity of the project is 450kt Spodumene concentrate per year. It is also planning to increase the capacity to 900kt by end of 2022.

Cauchari-Olaroz

Brine

Ganfeng holds 46.67% equity interests at project level, and 12.5% at LAC level. Project based in Jujuy Argentina. Project is in construction and planned a 40kt LCE capacity for stage I, commissioning in 2022. Planned Stage II capacity no less than 20kt LCE.

Mariana

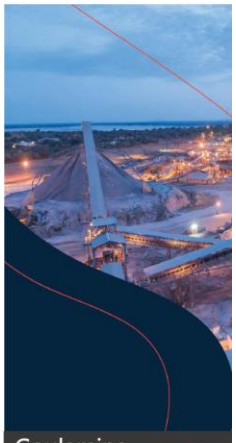
Brine

Ganfeng holds 100% equity interests. Project based in Salta Argentina. Project is in construction and planned a 20kt lithium chloride capacity. Solar power will be its main energy.

Sonora

Clay

Ganfeng holds 100% equity. Project based in Sonora Mexico, is one of the biggest lithium clay project. Initial production to be 20kt LIOH, with a potential to be expanded to 50kt LIOH. annually.



Goulamina

Spodumene

Ganfeng holds 50% equity interests at project leve. Project based in Mali. Project in construction and planned a Stage I capacity of 506kt Spodumene concentrate, capacity will get to 831kt for Stage II.

3

GanfengLithium

Capacity target 600kt by 2030.

Lithium chemical capacity by now

Lithium Chemical Capacity

Over 100,000 tons LCE supply capacity has been completed in 2022; Ganfeng capacity target of **600,000 tons LCE** before 2030.

Battery Recycling Capacity

A comprehensive recycling and processing capacity of **70,000 tons** of retired lithium-ion batteries and metal waste has been formed. Comprehensive **recovery rate of lithium >90%**, and the **recovery rate of nickel and cobalt metal >95%.**

Production bases	Location	Primary Products	Designed production capacity
Basic Lithium Plant	Xinyu, Jiangxi	Lithium hydroxide	81,000 tons/year
		Lithium chloride	12,000 tons/year
		Butyl lithium	1,000 tons/year
Xinyu Ganfeng	Xinyu, Jiangxi	High-purity lithium carbonate	5,000 tons/year
		Lithium fluoride	1,500 tons/year
Ningdu Ganfeng	Ningdu, Jiangxi	Lithium carbonate	20,000 tons/year
Hebei Ganfeng	Hebei	Lithium carbonate	6,000 tons/year
Yichun Ganfeng	Yichun, Jiangxi	Lithium metal	1,500 tons/year
Fengxin Ganfeng	Fengxin, Jiangxi	Lithium metal	650 tons /year

Note: the above production capacity planning includes the Company's existing sole proprietorship and joint venture projects

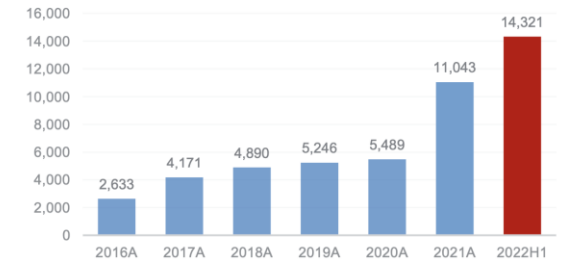
4

GanfengLithium

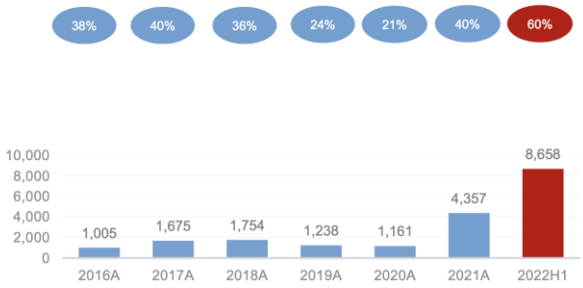
As the last presentation available in English is from 2022, we can see that numbers look normal before 2022.

Proven Financial Track Record

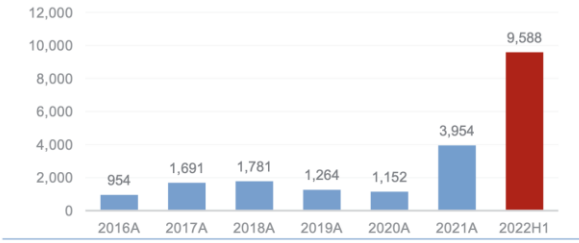
Revenue
(RMB mm, %, RMB 000/ton)



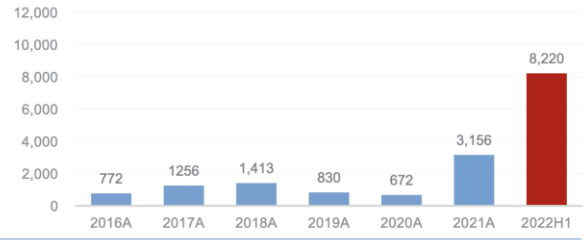
Gross Profit | Gross Profit Margin
(RMB mm, %)



Adjusted EBITDA[2]
(RMB mm, %)



Adjusted Net Profit[2]
(RMB mm, %)



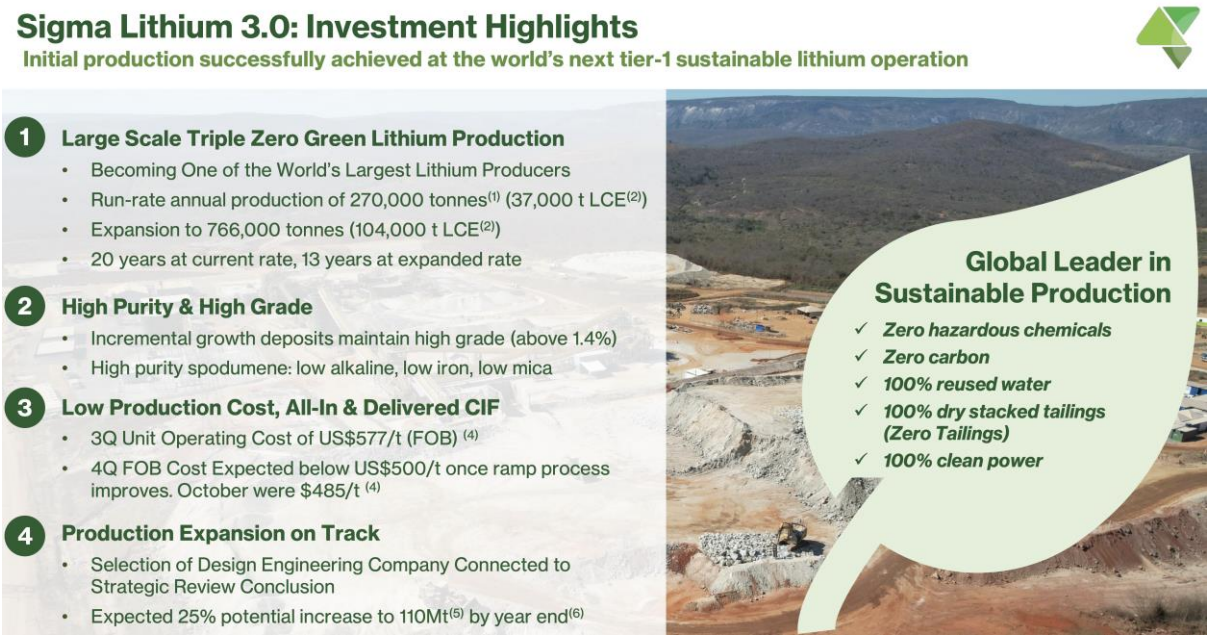
Source: Company disclosure.
Note: 1. Adjusted EBITDA and adjusted net profit were calculated as EBITDA / net profit plus impairment loss and losses relating to Shenzhen Meibai's fire incidents, minus fair value gains from derivative financial instruments, gain on derivative financial instruments and net gain on disposal of investments at fair value through profit or loss, excluding related income tax impact.

9

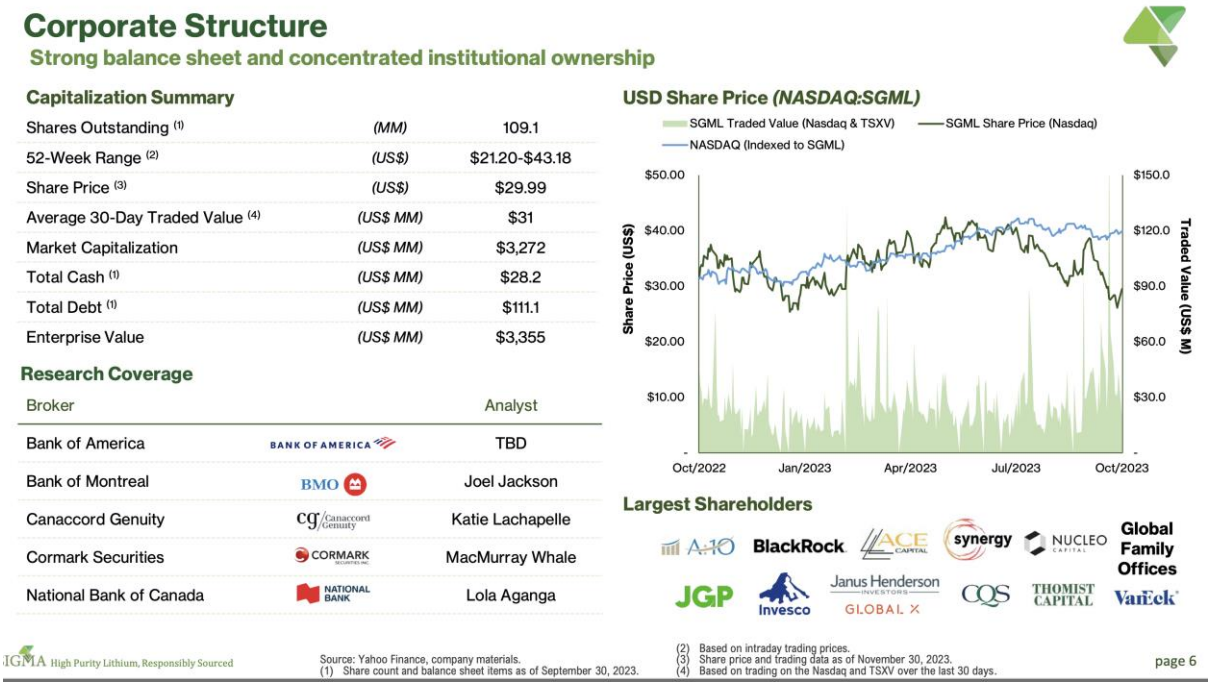
GanfengLithium

Sigma Lithium NASDAQ, CVE: SGML- Exuberant estimations

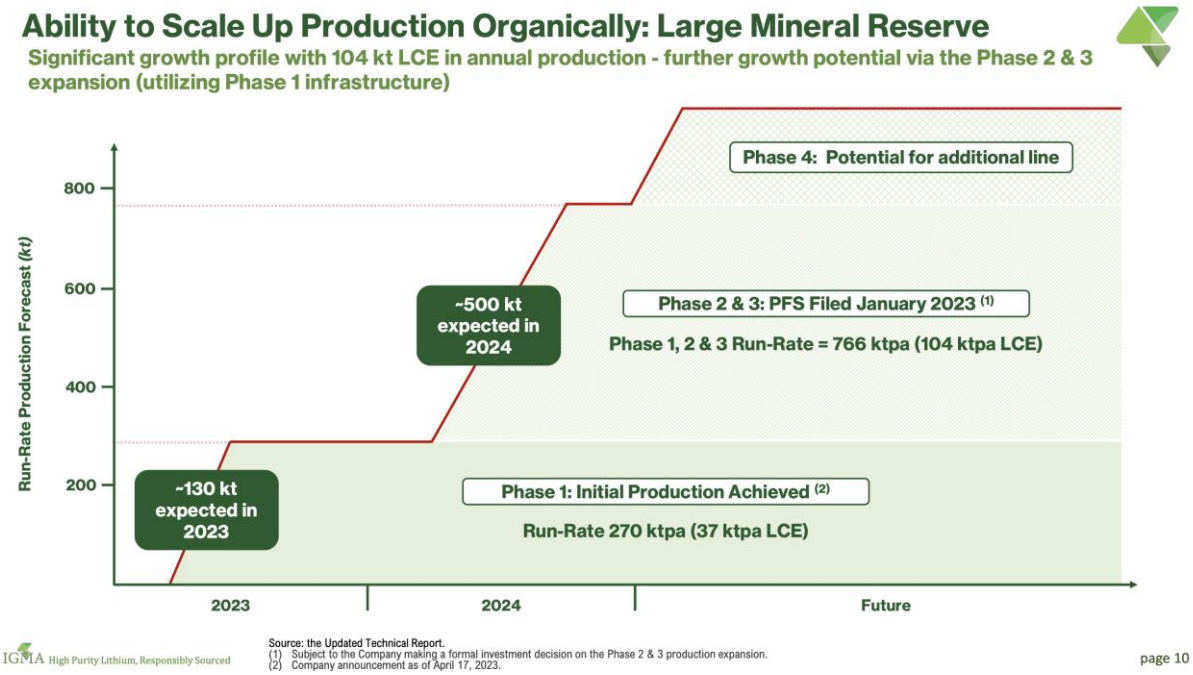
100kt equal production expected from Brazil:



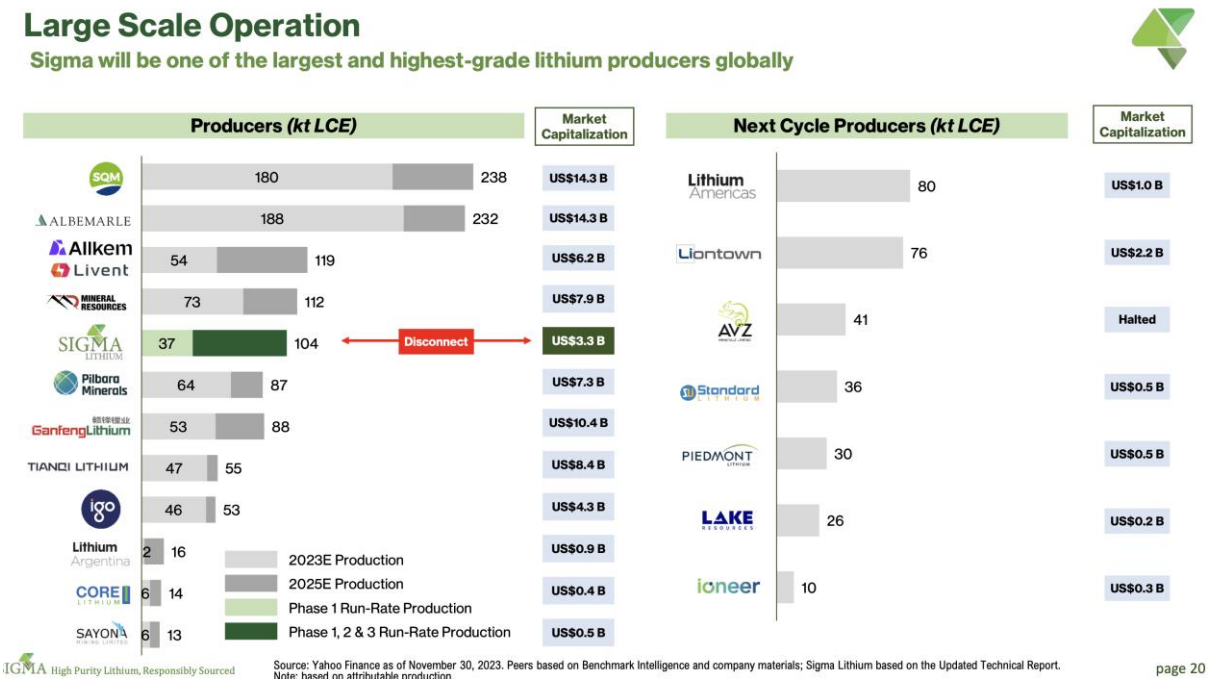
Low debt:



Production projection:



They say there is a disconnect between their production and market capitalization compared to others, but there is no more production above it in the cards while the others have production growth ahead except for SQM - so the management is tricking us a bit here.



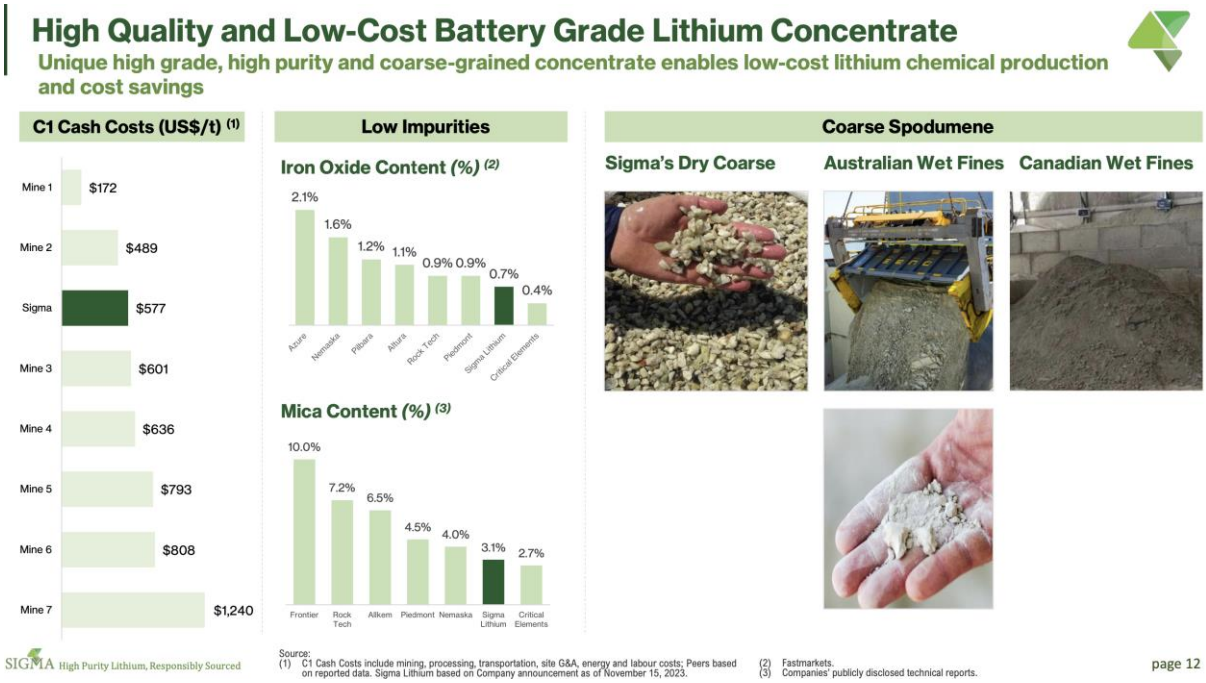
In Q3 they have reached $96 million in revenue with $36 million in profits on 38kt sold, thus approximately $3k per ton.

If they can triple production, that can go up to $100 million in net income per quarter or $400 million per year but spodumene prices have crashed.

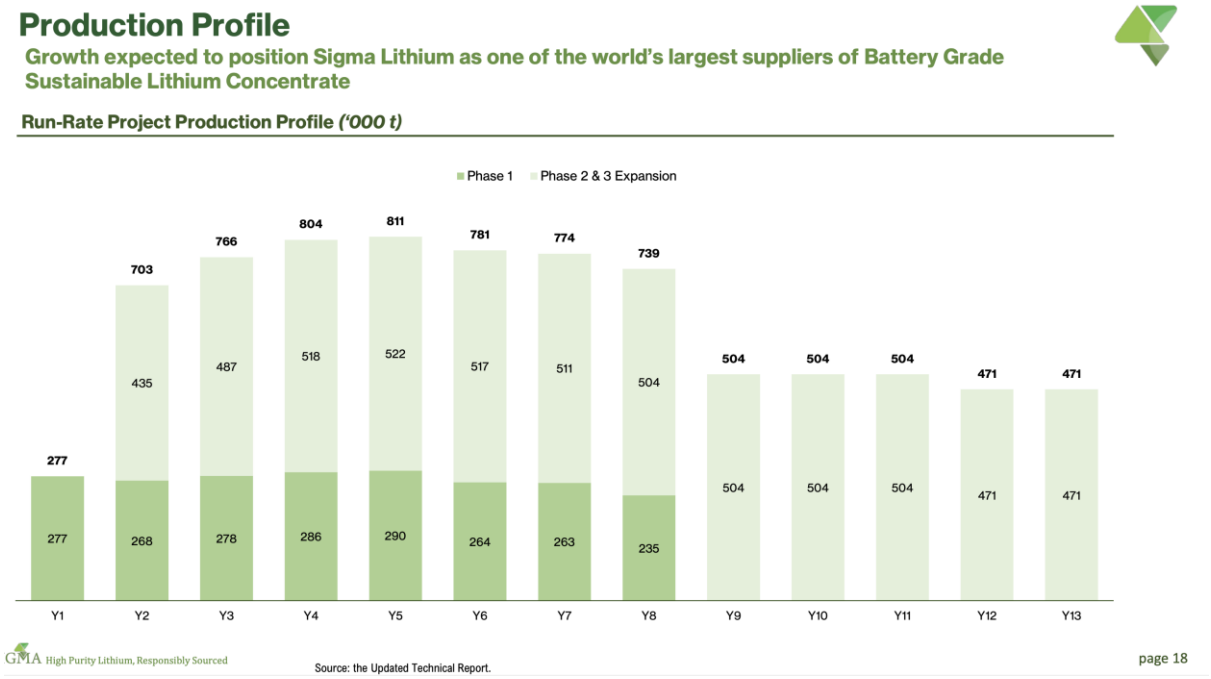
The costs after expansion should remain similar:

Spodumene prices, now at a third of what they were in the company's last financial quarter.:

They make battery grade lithium concentrate:



This is the production plan but there is also a phase 4 potential.



From the technical report I can see they will need $168 million for phase 2 & 3 which should be possible given the current net income but not if prices remain low as those are now.

Table 21-3 Phase 2 & 3 Concentrator Capital Cost Estimate Summary

AREA	TOTALS (USD)		
MEGA PLANT	DIRECTS + INDIRECTS (USD)	CONTINGENCY (USD)	TOTAL (Excluding recoverables) (USD)
000 MEGA (Excluding Sustaining Capital)	**144,429,471**	**10,473,002**	**154,902,473**
000 MEGA (Including Sustaining Capital)	**157,499,471**	**11,479,392**	**168,978,863**
001 MINE	**2,096,208**	**161,408**	**2,257,616**
001.001 Mine general	**0**	**0**	**0**
001.001.700 Mine pre-stripping		0	0
001.001.730 Mining Pre-Production	0	0	0
001.001.770 Mine Mobile Equipment - LME	0	0	0
001.001.780 FUELS & LUBRICANTS	0	0	0
001.002 Mine infrastructure general	**2,096,208**	**161,408**	**2,257,616**
001.002.635 Bridge	0	0	0
001.002.720 Mine Establishment	0	0	0

The highest cost is managing the waste:

Table 21-9: Phase 2 & 3 Estimated Capital Mining Cost

Operating Year	Mining Item	Cost ($US)
Year 0	Mobilization	692,206
	Site Construction	792,510
	Roads	772,899
	Sub Total	2,257,616
Year 4	Waste	56,729,223
Year 5	Waste	52,927,849
Year 6	Waste	50,830,672
	Total	**162,745,359**

These are the prices they have used for their economic calculations. Around $6,000 for the first 4 years and then declining to $2,000 long term.

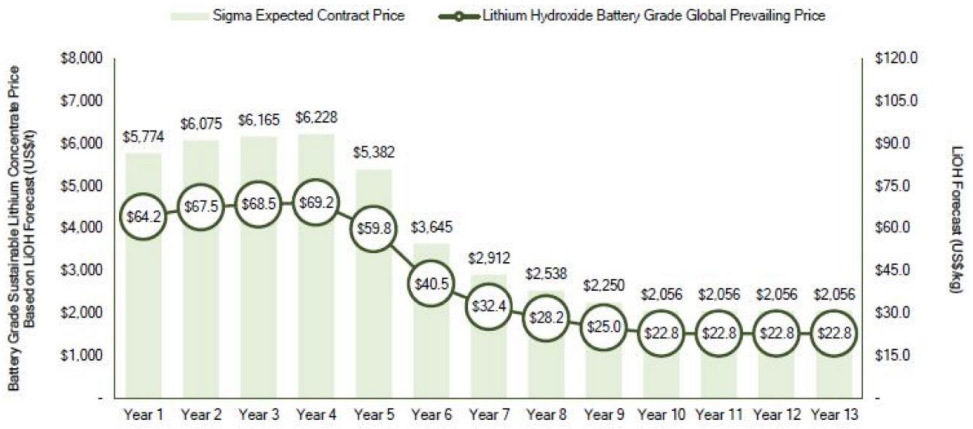


Figure 22-1: Spodumene Concentrate Price Forecast

Unfortunately, with current prices at $1,000, prices are much below their economic forecasts and consequently their calculations are totally wrong now.

22.2.2 Phase 1 DFS Financial Results

Table 22-4 and Figure 22-2 illustrate the after-tax cash flow and cumulative cash flow profiles of Phase 1 under the base case scenario. The intersection of the after-tax cumulative cash flow with the horizontal zero line represents the payback period of the Capex to production.

As highlighted in Table 22-4, the total gross revenue derived from the sale of spodumene concentrate is estimated at US$10.6 billion, an average revenue of US$4,909/t 5.5% SC with total operating costs (including royalty payments and commercial discounts) of US$1.3 billion at an average cost of US$581/t 5.5% SC. The resulting after-tax earnings margin (gross revenue less realization, operating costs and taxes) was estimated at US$7.9 billion.

This robust cash flow profile compares to an estimated remaining pre-production Capex of US$88.0 million (as of October 2022) which includes the DMS plant, non-process infrastructure, and owner's cost. The estimated sustaining and mine closure costs are approximately US$3.4 million and are considered in the base case of the economic study.

Additionally, a summary of the Phase 1 Financial Model under the base case scenario 5.5% is provided in Figure 22-3 below. The discount rate assumed for the pre- and after-tax NPV is 8%.

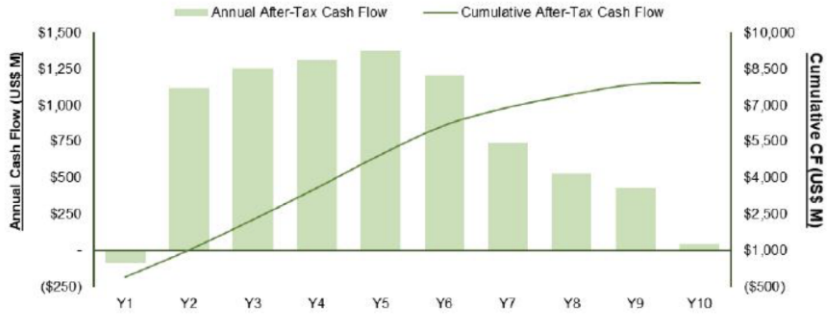


Figure 22-2: : Phase 1 After-Tax Cash Flow and Cumulative Cash Flow Profile @ 5.5% SC

They estimated revenue at $10 billion at an average price of $4,909 per ton, and profits of $7.9 billion. That is totally out of the question and maybe revenues now look like $2 billion, with little profits.

Table 22-4: Phase 1 Estimated Revenue and Operating Costs

	5.5% Li_2O SC	
	Total US$ M	**Avg. US$/t**
Gross Revenue	$10,605	$4,909
Less: Realization Costs		
Royalties	$299	$138
Commercial Discounts	-	-
Total Realization Costs	$299	$138
Net Revenue	$10,306	$4,771
Less: Site Operating Costs		
Mining	$422	$195
Processing	$122	$57
Selling, General & Administration	$62	$29
Transportation	$259	$120
Total Operating Costs	$866	$401
Less: Depreciation	$90	$42
Pre-Tax Earnings	$9,350	$4,328
% Pre-Tax Earnings Margin of Net Sales	*91%*	*91%*
Less: Taxes	$1,426	$660
After-Tax Earnings	$7,924	$3,668
% After-Tax Earnings Margin of Net Sales	*77%*	*77%*

Phase 2 & 3:

Table 22-6: Key Phase 2 & 3 Technical Assumptions

ITEM	UNIT	@ 5.5% LI_2O SC
Total Ore Processed (ROM)	Mt	42.9
Annual ROM Ore Processed	Mt	3.3
Run-Rate SC Production	Ktpa	496
Run-Rate LCE Production (Note 1)	Ktpa	67
Phase 2 Strip Ratio	Ratio	12.5: 1
Phase 3 Strip Ratio	Ratio	16.0: 1
Phase 2 Average Li_2O Grade	%	1.36%
Phase 3 Average Li_2O Grade	%	1.45%
Phase 2 Spodumene Recovery Rate	%	57.9%
Phase 3 Spodumene Recovery Rate	%	50.6%
Spodumene Concentrate Grade	% Li_2O	5.5%
Operating Life	Years	12
Total Cash Cost ex. Royalties (@ Mine Gate)	US$/t SC	$292
Total Cash Cost incl. Royalties (@ Mine Gate)	US$/t SC	$394
Transportation Costs (CIF China)	US$/t SC	$120
Total Cash Cost (CIF China)	US$/t SC	$514
AISC (CIF China)	US$/t SC	$516
Mining Costs	US$/t Material Mined	$2.25
Processing Costs	US$/t ROM	$7.06
G&A Costs	US$/t ROM	$2.68

Note 1: tonnage based on direct conversion to LCE excluding conversion rate

Another crazy estimation there:

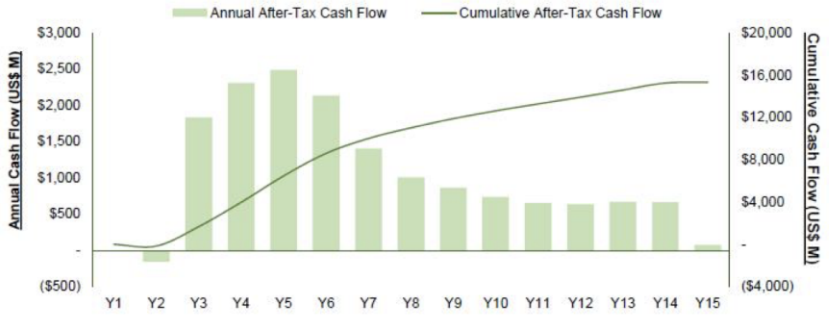


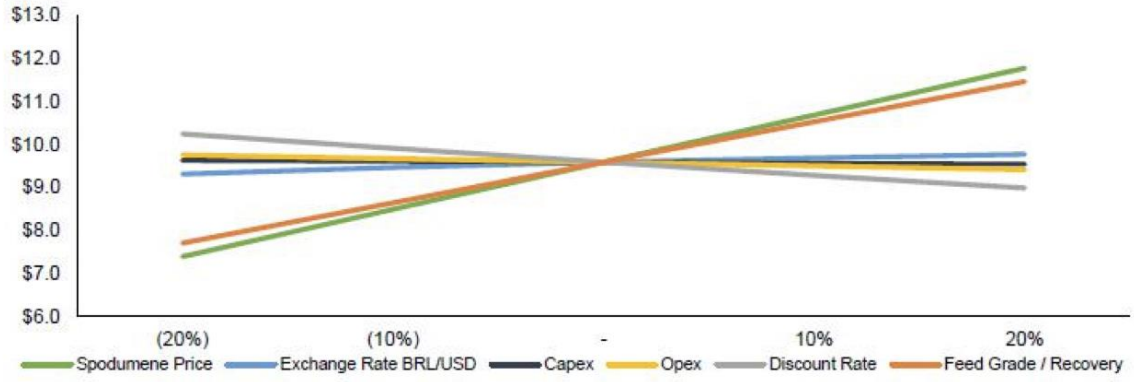
Figure 22-6: Phase 2 & 3 After-Tax Cash Flow and Cumulative Cash Flow Profile @ 5.5% Li_2O SC

Table 22-7: Phase 2 & 3 Estimated Revenue and Operating Costs

	5.5% Li_2O SC	
	Total US$ M	**Avg. US$/t**
Gross Revenue	$21,477	$3,610
Less: Realization Costs		
Royalties	$605	$102
Commercial Discounts	-	-
Total Realization Costs	$605	$102
Net Revenue	$20,872	$3,508
Less: Site Operating Costs		
Mining	$1,320	$222
Processing	$303	$51
Selling, General & Administration	$115	$19
Transportation	$714	$120
Total Operating Costs	$2,453	$412
Less: Depreciation	$324	$55
Pre-Tax Earnings	$18,094	$3,042
% Pre-Tax Earnings Margin of Net Sales	*87%*	*87%*
Less: Taxes	$2,759	$464
After-Tax Earnings	$15,335	$2,578
% After-Tax Earnings Margin of Net Sales	*73%*	*73%*

Estimations were made with average prices of $3,610 that are now at $1,000.

A 20% change in spodumene prices lowers their net present value from $10 billion to $7 billion, that is from $3600 to $3000 do I have to mention spodumene prices are now at 25% of their estimation?



Thus, at current prices, the net present value of the project is likely negative. This is a bet on higher future lithium prices for longer, as I say, a bet.

This is the total for all phases with a spodumene price average estimation of $3,956:

NI 43-101 TECHNICAL REPORT
GROTA DO CIRILO LITHIUM PROJECT

Additionally, a summary of the Phase 1, 2 & 3 Financial Model under the base case scenario 5.5% is provided in Figure 22-11. The discount rate assumed for the pre- and after-tax NPV is 8%.

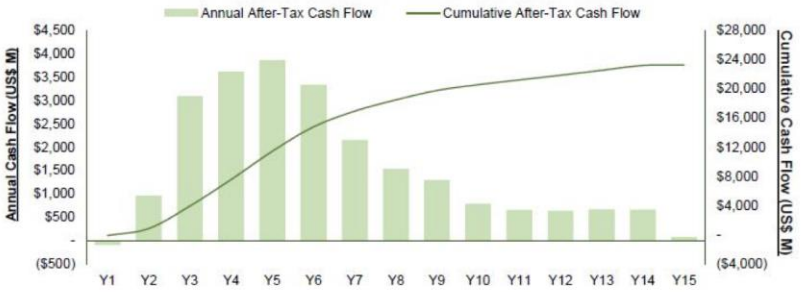


Figure 22-10: Phase 1, 2 & 3 After-Tax Cash Flow and Cumulative Cash Flow Profile @ 5.5% Li_2O SC

Table 22-10: Phase 1, 2 & 3 Estimated Revenue and Operating Costs

	5.5% Li_2O SC	
	Total US$ M	**Avg. US$/t**
Gross Revenue	$32,082	$3,956
Less: Realization Costs		
Royalties	$904	$112
Commercial Discounts	-	-
Total Realization Costs	$904	$112
Net Revenue	$31,178	$3,845
Less: Site Operating Costs		
Mining	$1,742	$215
Processing	$426	$53
Selling, General & Administration	$178	$22
Transportation	$973	$120
Total Operating Costs	$3,319	$409
Less: Depreciation	$416	$51
Pre-Tax Earnings	$27,443	$3,384
% Pre-Tax Earnings Margin of Net Sales	*88%*	*88%*
Less: Taxes	$4,185	$516
After-Tax Earnings	$23,258	$2,868
% After-Tax Earnings Margin of Net Sales	*75%*	*75%*

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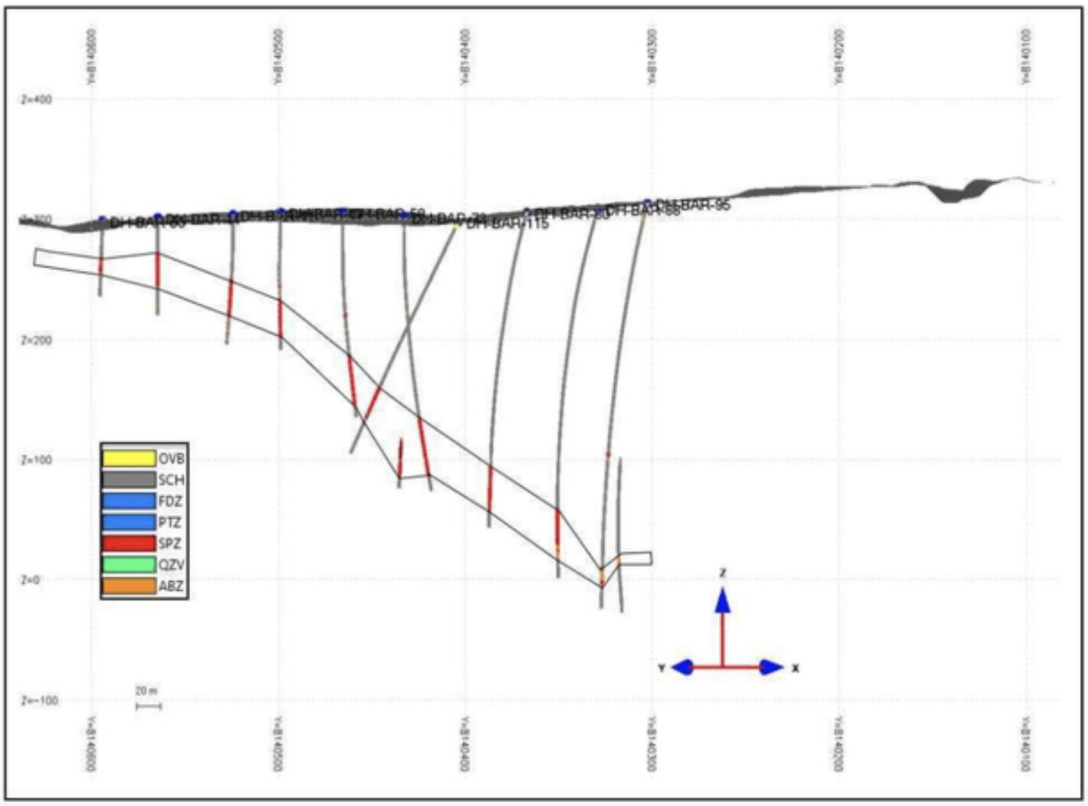
Page | 582

$32 billion in revenues for $27 billion in pre-tax earnings over 15 years. We are now at a quarter of their estimated spodumene prices, thus I have $8 billion in revenue and maybe $3 billion in earnings, which discounted is much more than the market capitalization.

I think this shows the trickiness of lithium as it is not that rare, and can be extracted at low costs.

$3 billion in earnings with current pricing, means the market cap should be around $1.5 billion, which is a risk given the current market cap.

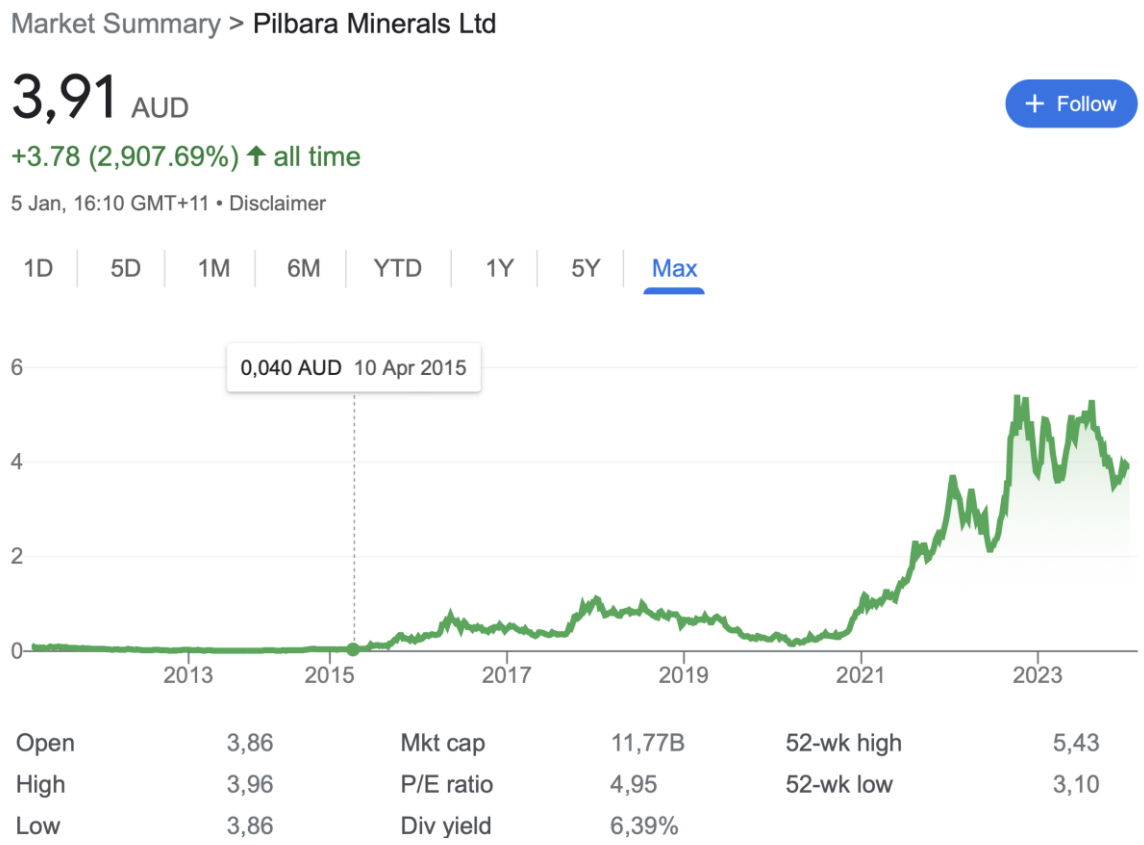
Sigma is too much Wall Street for me, from the CEO etc... they played it well during the boom, but.... I don't know, the ore will be deeper, thus costlier to mine, sold at lower prices etc...



I wish them well, but risks just pile when you look at this at the current valuation.

Pilbara Minerals- Looks good!

It is surprising that unlike other lithium stocks trading in the US, Pilbara Minerals is down just 14% from its peak while the run up was better than anything I've seen till now.

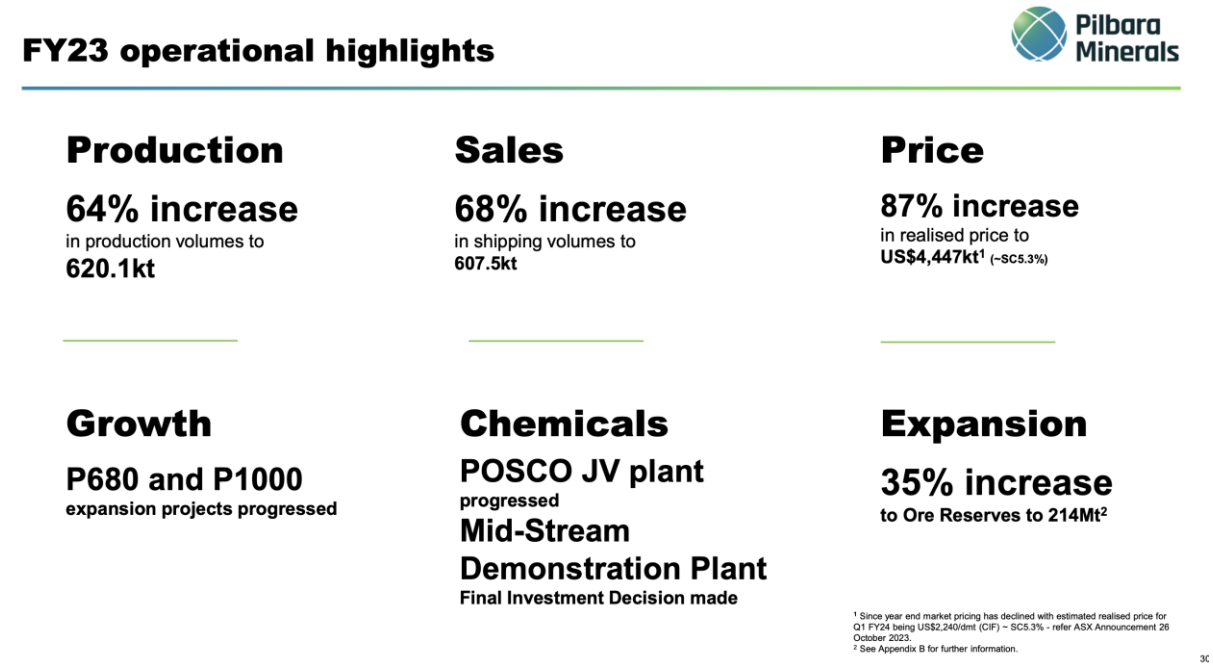


The numbers above are in AUD, there is a dividend and much more growth ahead planned.

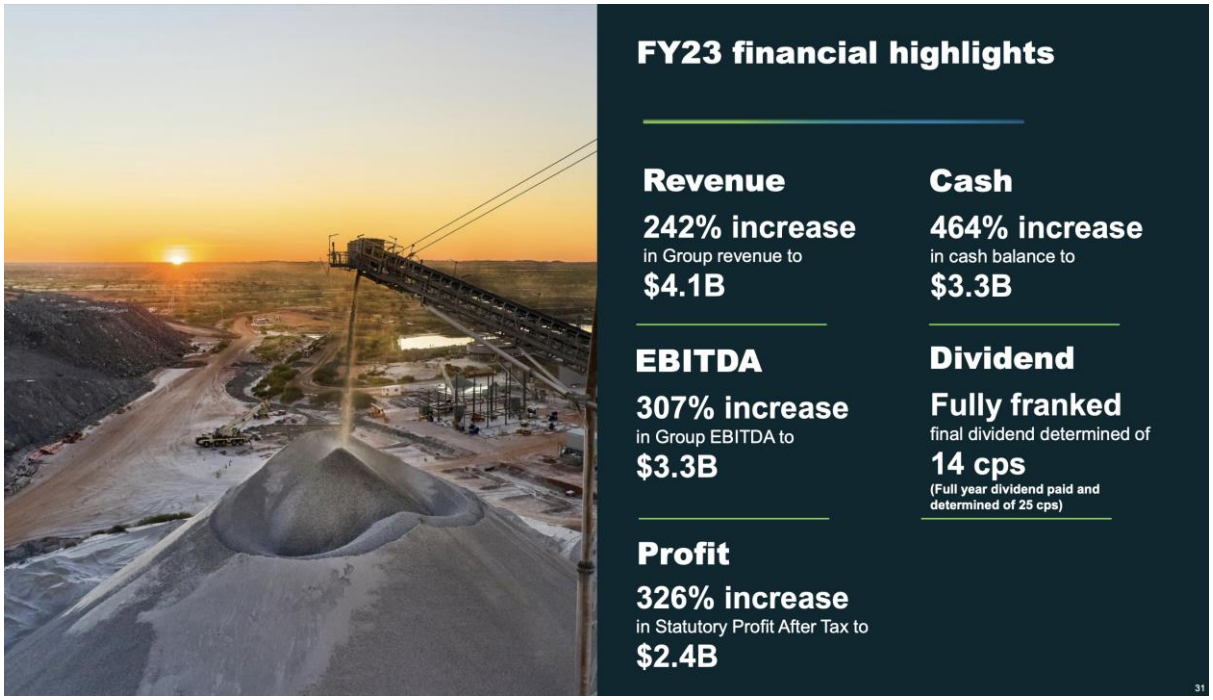
Pilbara Business Overview

They own the Pilgangoora lithium mine and 8% of the global lithium supply based on 2023 and plan to expand that by 70%.

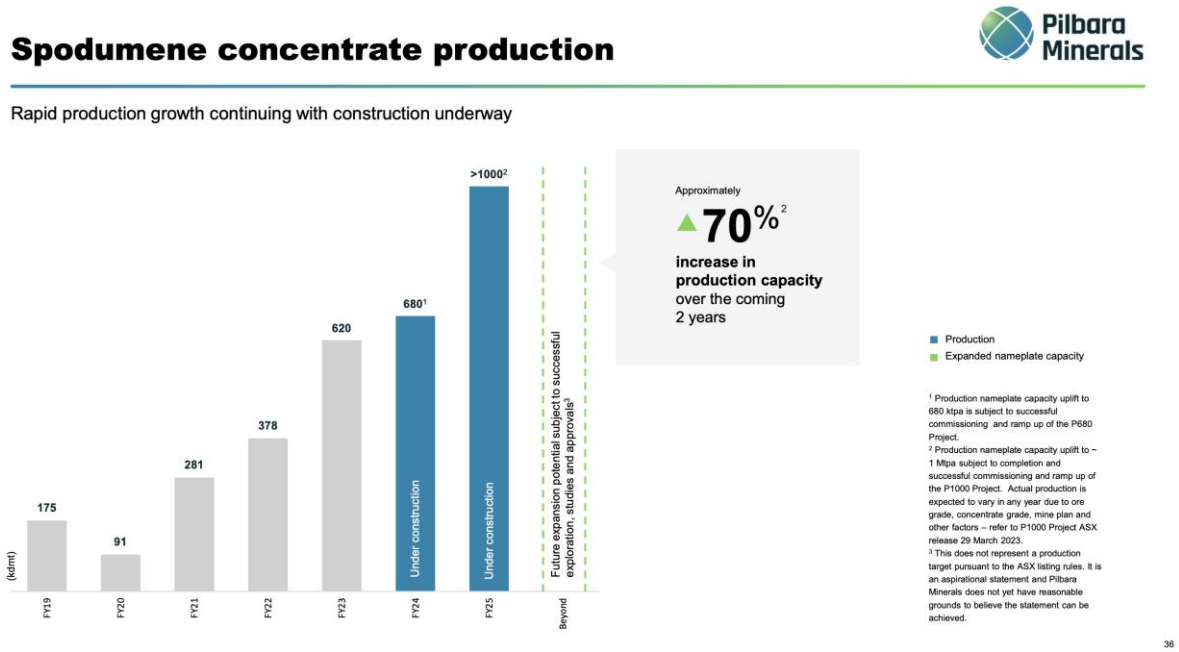
They produced 620kt of spodumene in 2023 and if they grow that by 70% we are at 1,054kt.



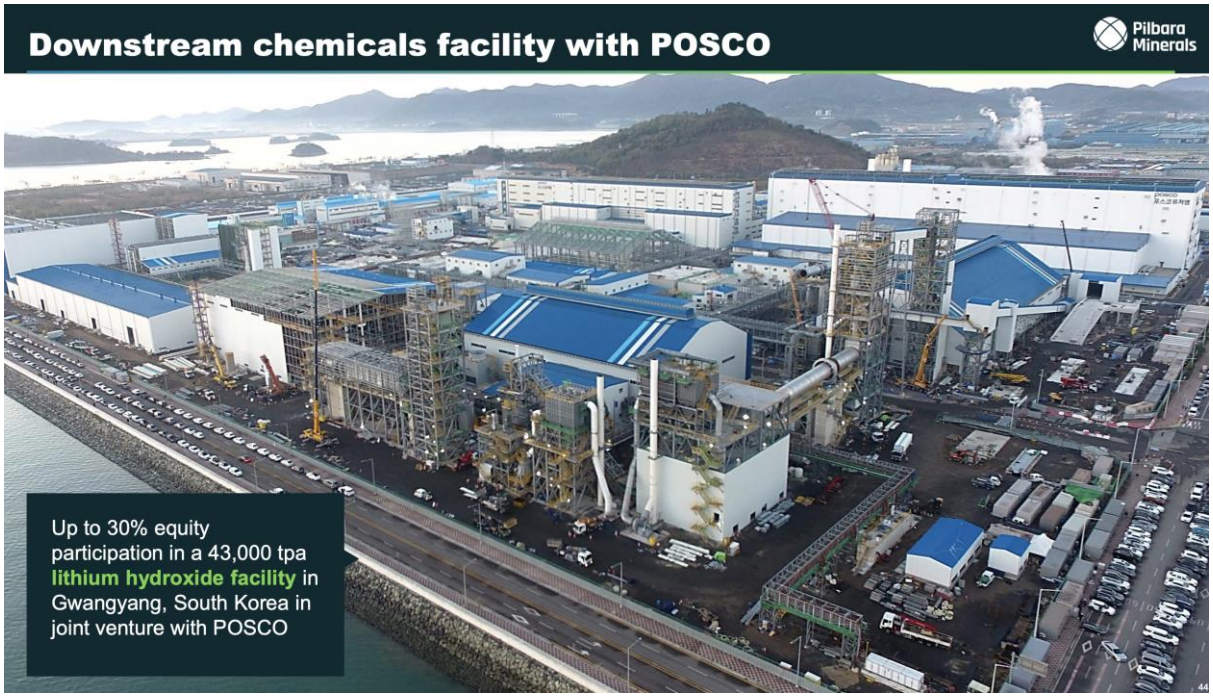
The above high realized prices led to high revenues and cash flows that will allow for all the expansion projects and the dividend.



Growth will be fast and there by 2025.



They are also investing a bit in the downstream with POSCO.



Growth projects; P680 will increase production by 100,000tpa costing $404million while the P1000 project should increase to 1,000,000 tpa by end 2025.

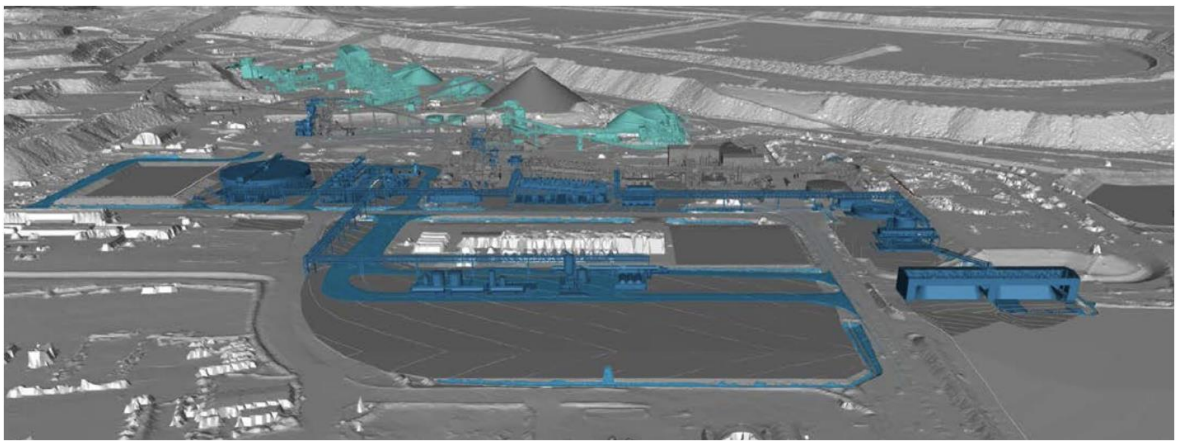
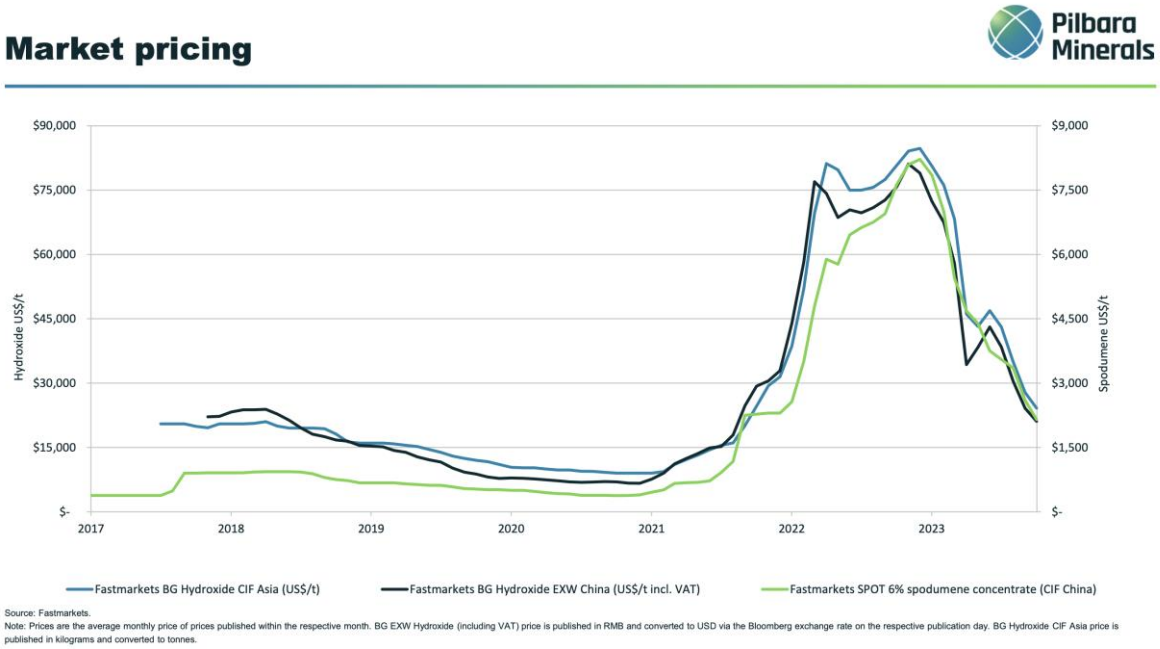


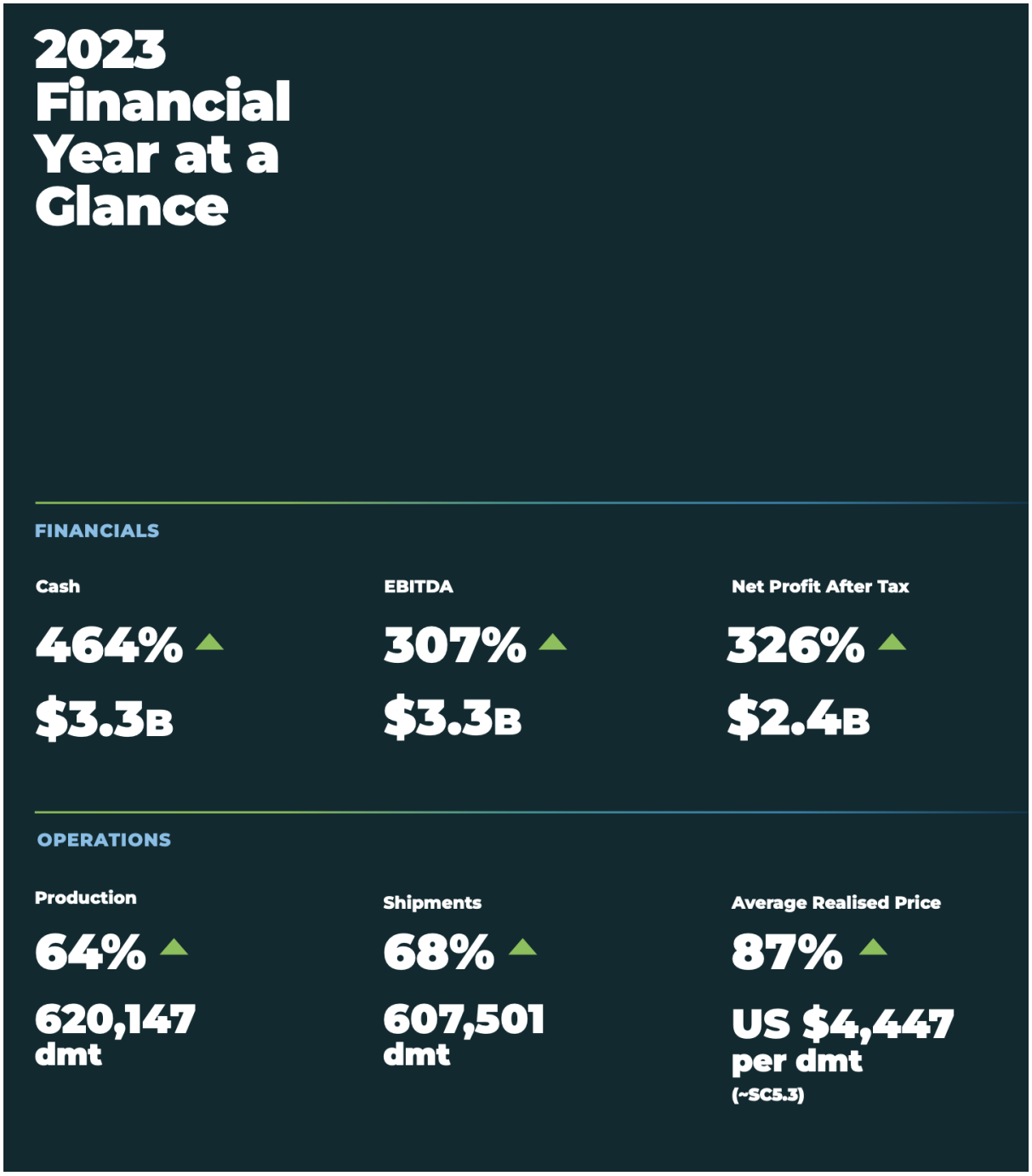
Figure 8: Pilgan Plant schematic i) P680 Project in teal and ii) P1000 Project Expansion in dark blue

Pilbara financials and valuation



If spodumene prices remain where those are now, Pilbara's revenue going forward will be a quarter of what it was in 2023.

2023 FY financials:



Revenue would go from $4.1 billion to $1 billion, which would put EBITDA at zero and net profits below zero while cash flows should be positive given Pilbara's low production costs.

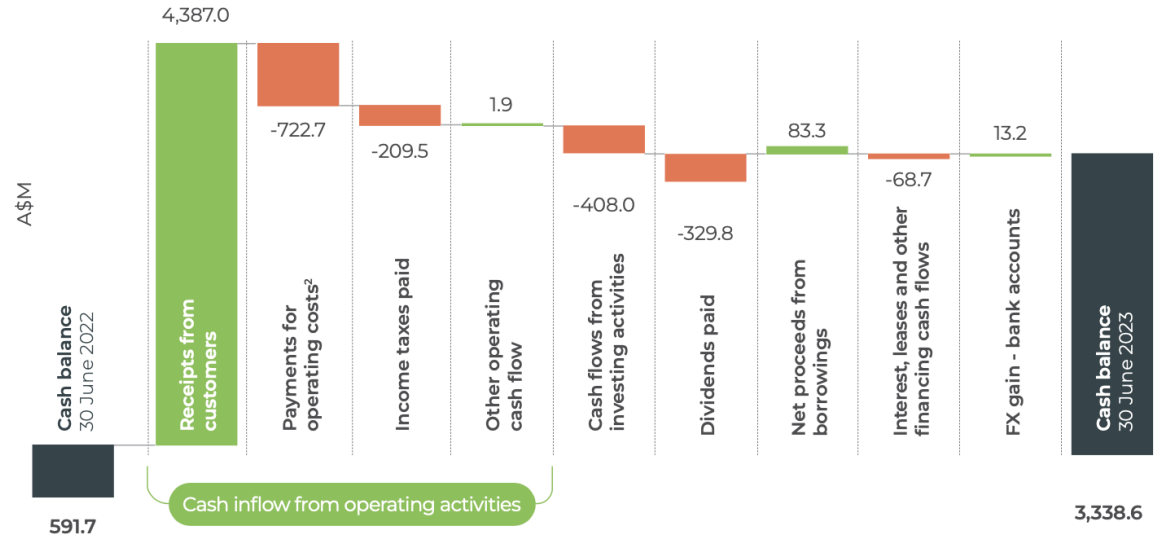
The cash conversion should remain positive and funding the growth ahead:

Table 1: Key Financial Results

FINANCIAL KEY PERFORMANCE INDICATORS	FY23 $M	FY22 $M	VARIANCE %[3]
Revenue[4]	4,064.0	1,189.6	241.6%
Gross margin[5,6]	3,392.1	853.5	297.4%
EBITDA	3,317.2	814.5	307.2%
EBITDA margin[3]	82%	68%	13.1%
EBIT	3,211.3	769.1	317.5%
EBIT margin[3]	79%	65%	14.4%
Net profit after tax	2,391.1	561.8	325.6%
Cash	3,338.6	591.7	464.2%
Basic earnings per share (cents)	79.91	18.98	321.0%
Ordinary dividends per share[7] (cents)	25.0	0.0	N/A
Weighted average ordinary shares on issue (million)	2,992.2	2,960.0	1.1%

Their operating costs of 722 million AUD per 600kt production suggest costs of $1,100 per ton thus close to no cash flows going forward.

Figure 3: Sales Drive Cash Balance Growth



With $3.3 billion in cash on the balance sheet there should be plenty of money to sustain the downturn.

Pilbara investing risk and reward

I feel the stock isn't going down because the market must think $1,000 spodumene prices are not sustainable. But when I look at it, costs don't suggests prices should be much higher. Of course, it will depend on global demand but Australia is low cost and has a lot of production and production growth ahead.

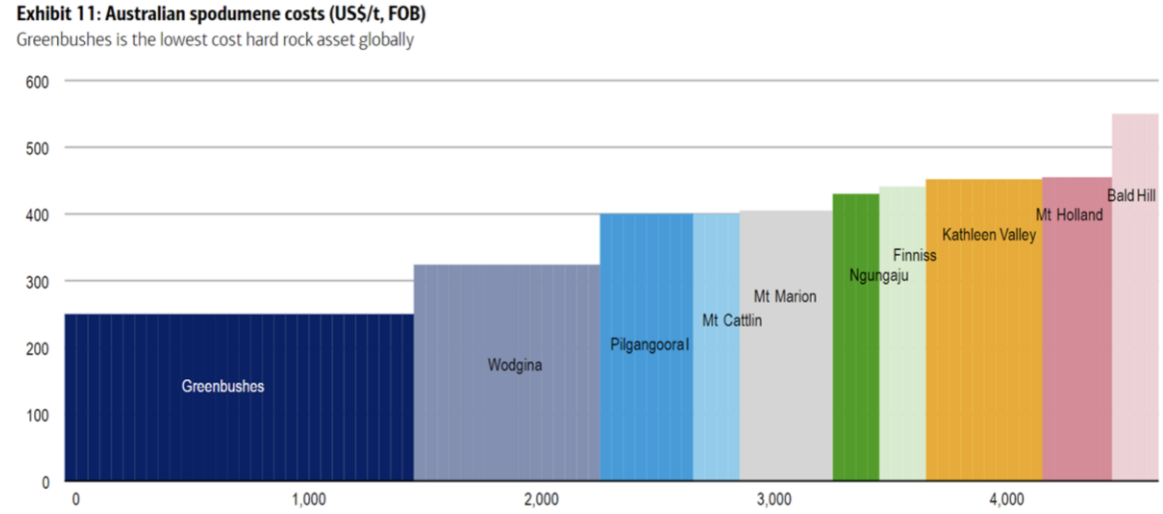
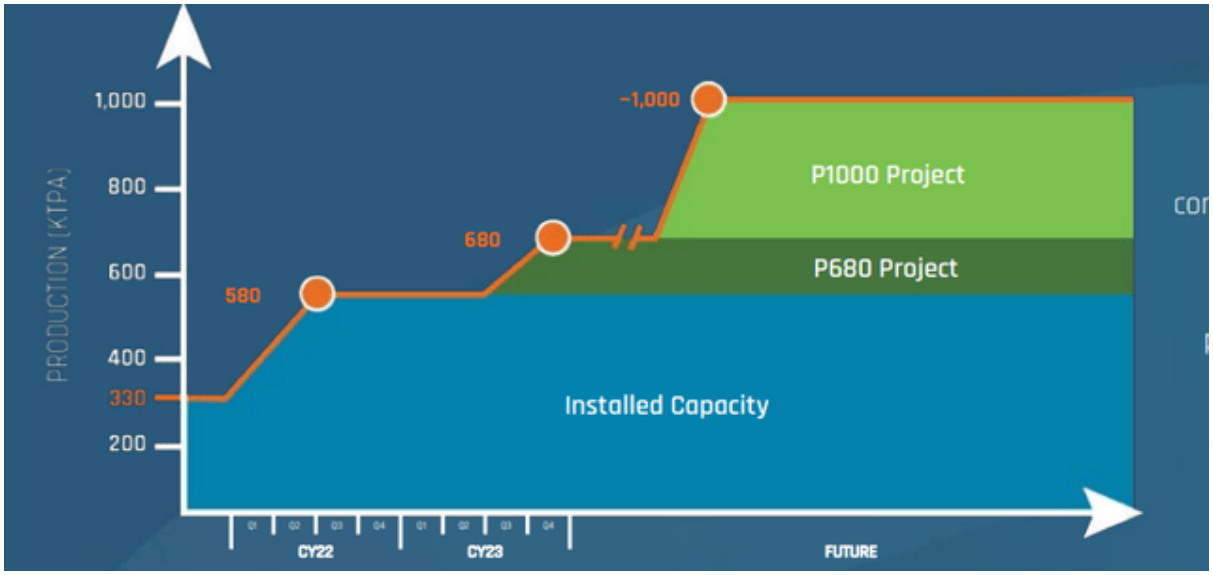


Figure 4 - BofA Global Research, January 2022

Of course, the price is set by the marginal producer, so it will all depend on supply and demand.

Pilbara should be producing 1000kt per year, at $1,500 USD the revenue would be 1.5 billion and with costs of $500, the operating profits would still be in the billion range. Of course, if prices are $1,000, operating profits $500 million and just a few hundred million of net profit.



They should reach FOB costs of $600 over time given the scale.

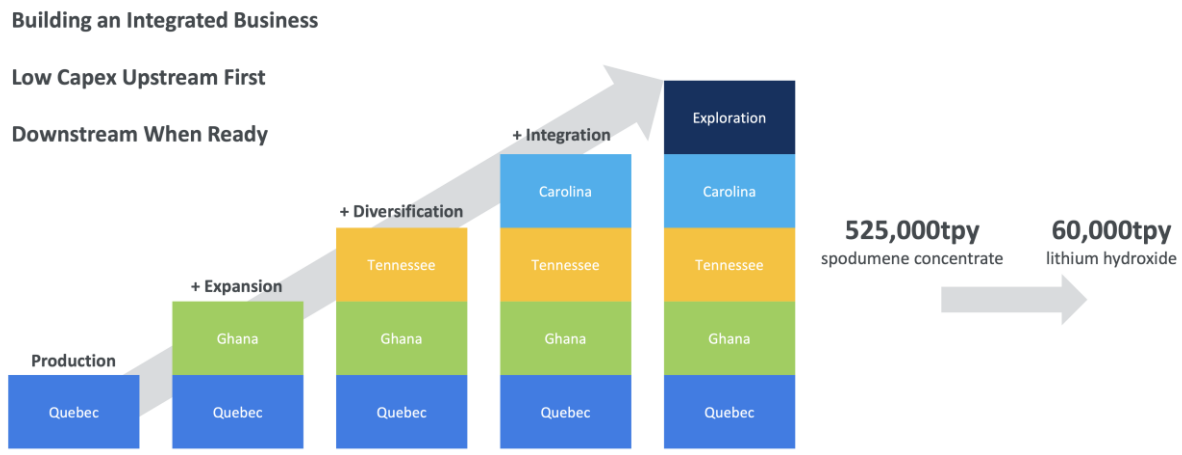
> Unit operating cost (FOB) in Q1 FY24 was $747/t reflecting operational readiness costs in support of the P680 expansion project and lower production volume relative to Q4 FY23. Unit operating costs are expected to decline over FY24 as production volumes increase from P680.

Source: Pilbara Annual Report.

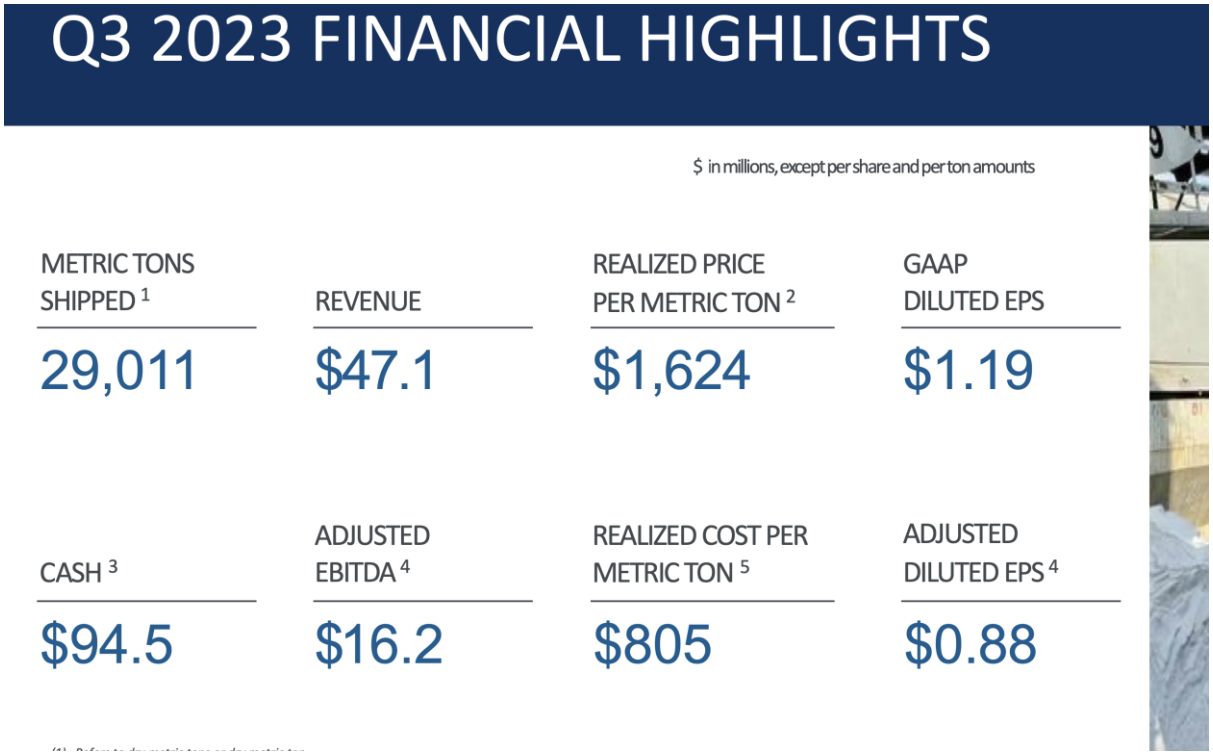
Looks good, no matter the price, they should be profitable, which is what we look for as value investors. The market cap is low at $11 billion AUD given what these guys can make in the future. USD$ 1 = AUD $1.49

Piedmont Lithium

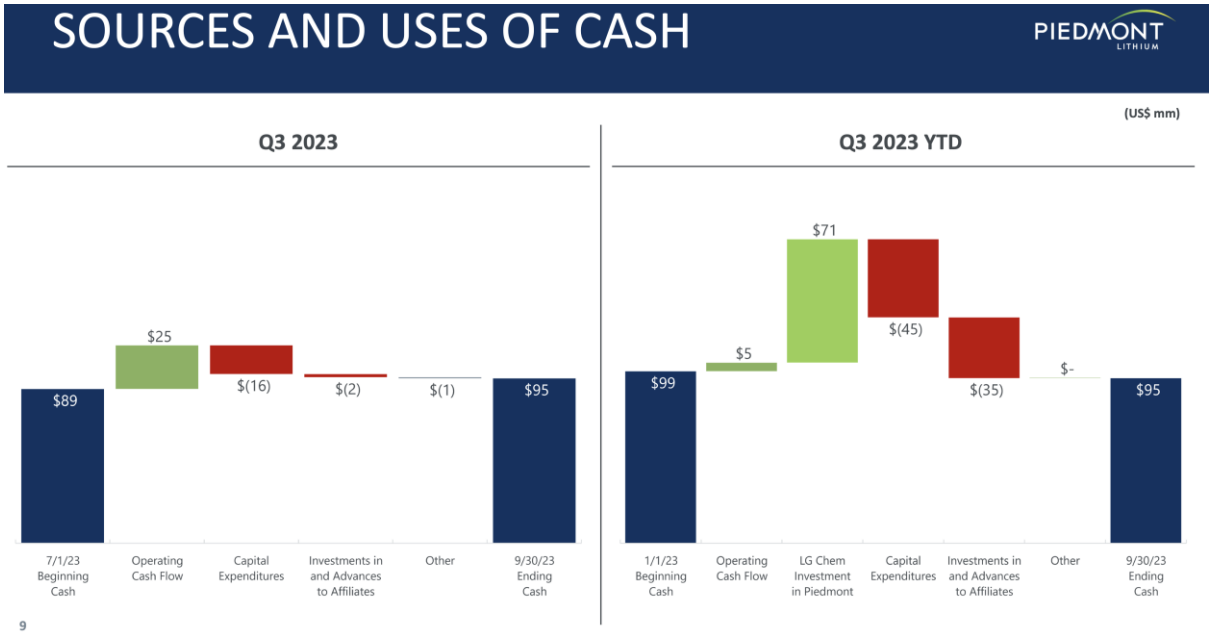
a few smaller projects with expected growth ahead:



They did well in Q3, but with prices going lower, things will look uglier going forward:



I also see they are still raising equity and investments, like the last one from LG Chem.



In short, still in development and this can have several outcomes because developing in Ghana is not easy, while even in the US and Canada there can always be issues. Production costs should be on the higher end and thus I prefer to stick to lower costs producers.

Mineral Resources ASX- diversified, iron ore focus

Mineral Resources is mostly an iron ore producer

their iron ore production costs and on the upper side of the cost curve while they have stakes in Mr Marion and Wodgina for lithium.

FY24 GUIDANCE

	IRON ORE		LITHIUM		
	YILGARN HUB	PILBARA HUB (PREVIOUSLY UTAH POINT)	MT MARION	WODGINA	
MinRes Share	100%	100%	50%	40%[1]	40%[1]
Product	Iron ore 20% Lump	Iron ore 15% Lump	Spodumene Grade 4.0%	Spodumene Grade 5.5%	Lithium battery chemicals
Volume (MinRes share)	7.5 to 8.3Mt	9.0 to 10.5Mt	190 to 220kdmt (SC6 equivalent)	170 to 200kdmt (SC6 equivalent)	20 to 25kt
FOB Cost	$97 to $107/t	$67 to $77/t	$1,150 to $1,250/t (SC6 equivalent)	$875 to $950/t (SC6 equivalent)	N/A
MINING SERVICES VOLUMES 260 – 280MT					

MINERAL RESOURCES

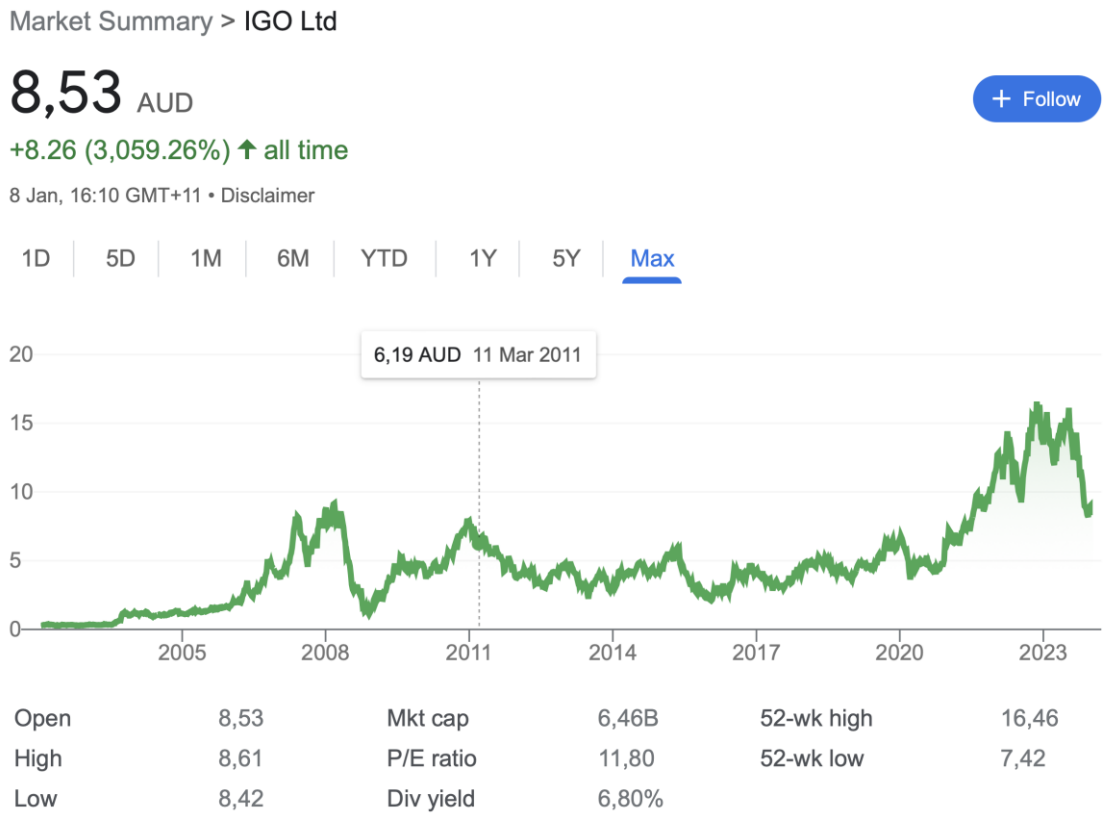
1. Guidance assumes 40% ownership for FY24. Completion of the revised MARBL JV agreement as set out in the ASX announcement 20 July 2023 is expected in Q2 FY24, at which time MinRes' equity share of Wodgina increases to 50%.

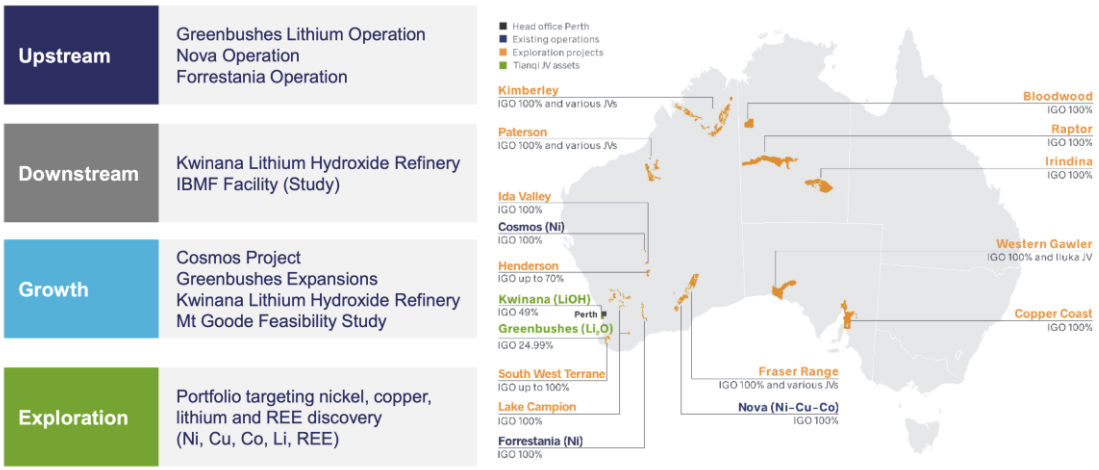
Their key project is Onslow iron that should have costs of $40 per ton and thus be competitive with the larger iron ore producers. They will invest $2 billion in that in 2024 for a total capex of $3 billion.

Maybe to look at when iron ore is down, but they do have also debt.

IGO ltd.

IGO is a lithium nickel producer from Australia owning 25% of the Greenbushes Lithium mine.



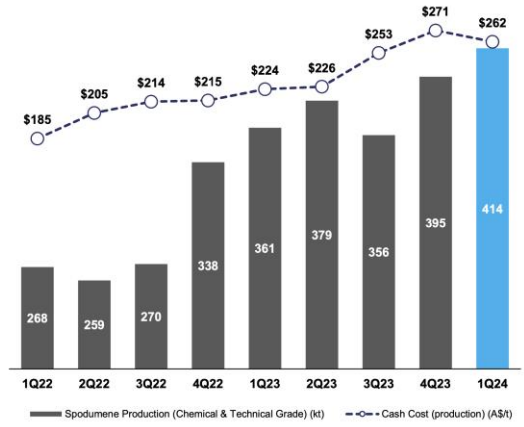


Greenbushes

TIANQI LITHIUM ENERGY AUSTRALIA
a Tianqi Lithium—IGO joint venture

Outstanding operational and financial performance in FY23

Quarterly Production and cash cost (production)[1]



1. 100% basis.

FY23 Performance

Spodumene production of 1.49Mt, a record for the business with industry leading cash costs (production) of $244/t

Operational performance delivered alongside significant growth projects on site

Underlying EBITDA[1]: **$9.5Bn** ↑**606% YoY**

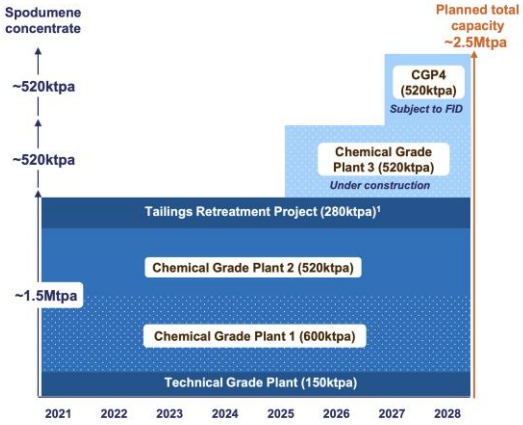
FY23 EBIDTA Margin: **91%**

Greenbushes

TIANQI LITHIUM ENERGY AUSTRALIA
a Tianqi Lithium—IGO joint venture

Multiple strategic growth projects

Greenbushes Production (100%)



Greenbushes Growth Priorities

Processing Capacity	Expanding processing capacity to deliver higher production rates
Mining Capacity	Improving efficiencies via new mining contractor and expanding support infrastructure
Optimisation	Maximising productivity via process continuous improvement and de-bottlenecking
Underground	Assessing underground potential as part of life-of-mine planning
Satellite Feed	Investing in exploration and studies to assess opportunities outside existing resource

25% of 2.5mtp is 625kt, at cash costs of production of $300 the profits are still $700 per ton at current prices, or $4.3 billion for their share. I need to do a deeper dive here.

Tianqi Lithium Corp HK: 9696

Market Summary > Tianqi Lithium Corp

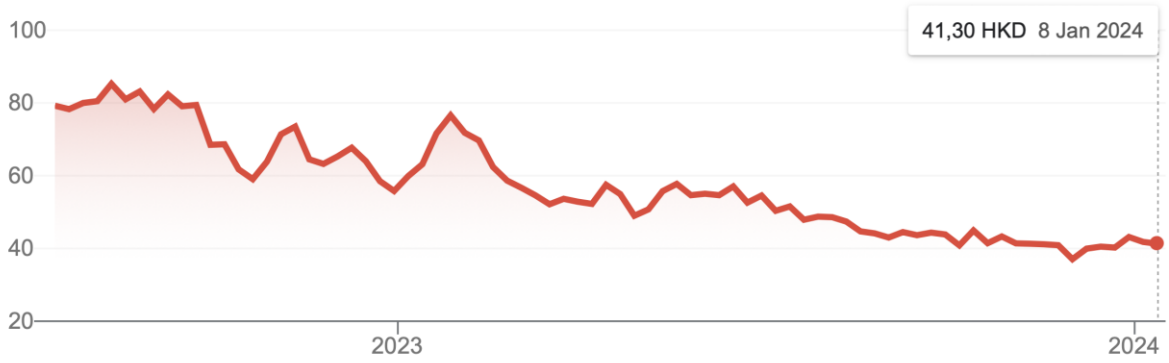
41,30 HKD

+ Follow

-37.95 (-47.89%) ↓ all time

8 Jan, 16:08 GMT+8 • Disclaimer

1D | 5D | 1M | 6M | YTD | 1Y | 5Y | Max



Open	41,95	Mkt cap	92,73B	52-wk high	78,00
High	42,85	P/E ratio	2,89	52-wk low	36,45
Low	40,90	Div yield	7,97%		

these guys own 25% of SQM.

SQM Transaction

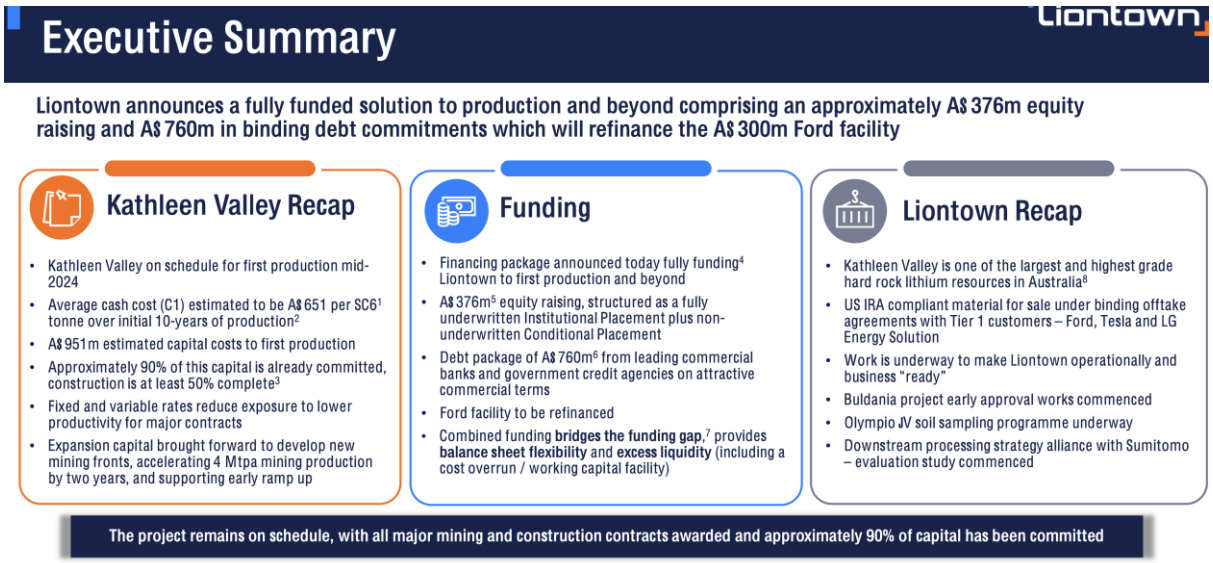
We purchased a 23.77% stake in Chilean lithium miner Sociedad Quimica Y Minera De Chile ('SQM') at a total price of approximately $4 billion in December 2018. We are now its second largest shareholder with a total of 25.86% share in SQM. As a world-leading brine-based lithium producer, SQM operates a world-class brine resource, the Atacama Salt Lake. The transaction will benefit us with stable long-term financial returns and serve our goal of globalizing our business footprint.

Unfortunately they don't have a good site in English so I can't analyze much :-(

Liontown Resources

Albemarle was supposed to take them over but then changed its mind.

They still need a bit to close their finances to fully develop their Kathleen Valley project at costs of around USD $433 per ton of production (spodumene)

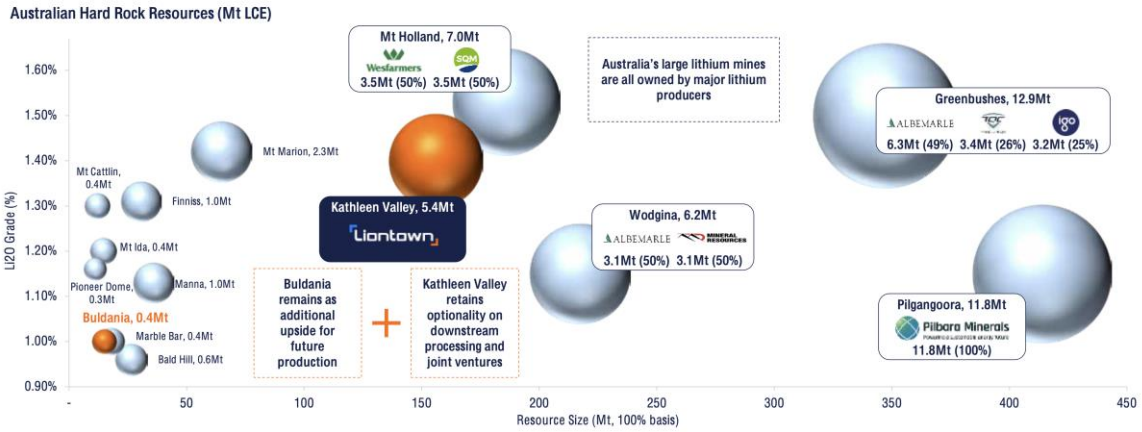


NOT FOR RELEASE OR DISTRIBUTION IN THE UNITED STATES

Large Scale, High Grade, Independent

Liontown

Kathleen Valley is uniquely positioned as a wholly-owned, large and high-quality hard rock lithium resource in Australia, with Tier 1 offtake customers from South Korea and the United States



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Operating Costs

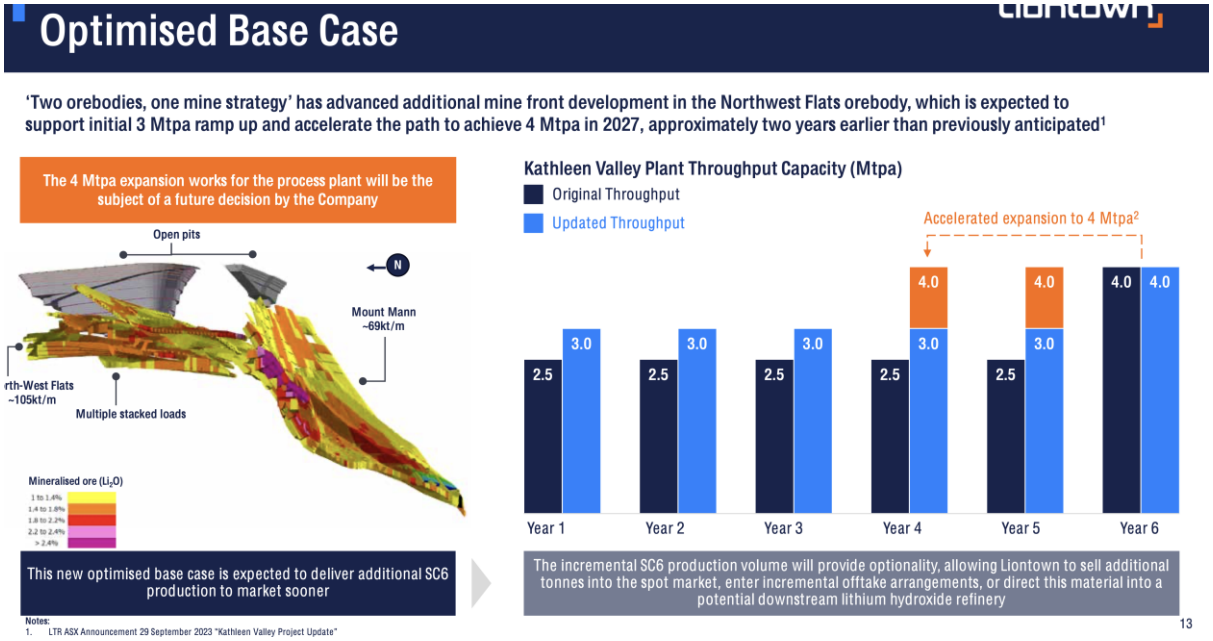
Liontown

The Company estimates a 10-year average cash cost (C1) of A$ 651[1] per SC6[2] tonne, excluding royalties and sustaining capital

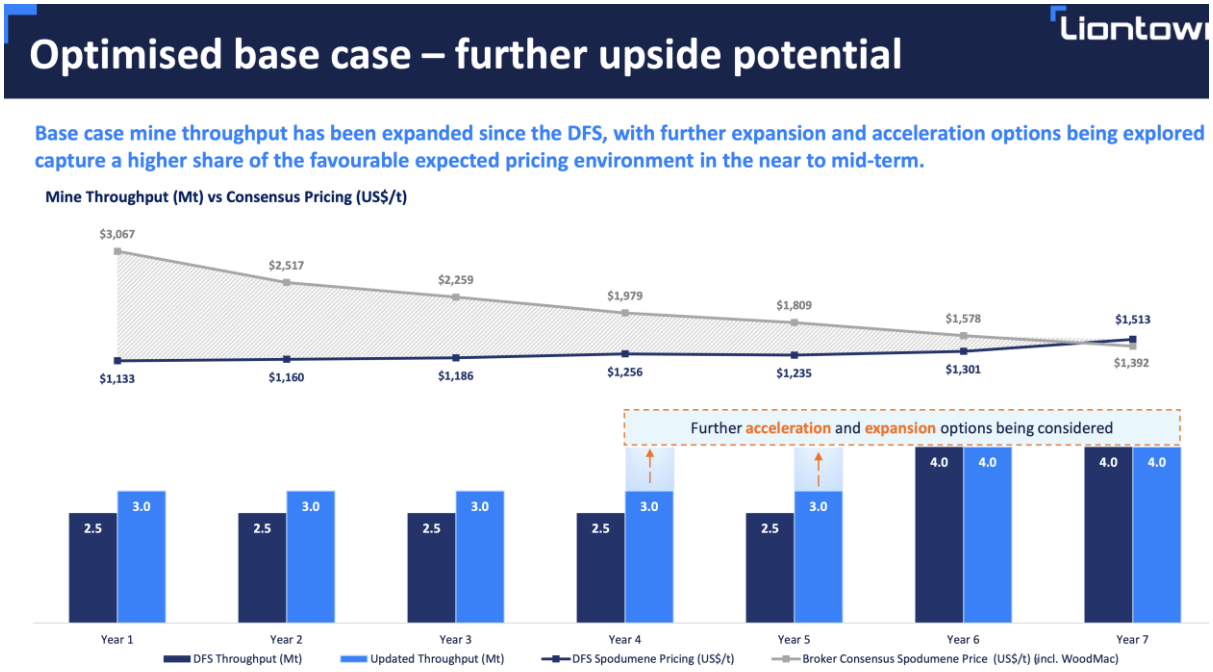
Production from 1 January 2025 [3, 4]		
Cost element	**Unit**	**10-year Average**
Mining	A$ /dmt SC6	449
Processing	A$ /dmt SC6	157
G&A (site processing)	A$ /dmt SC6	39
Transport and logistics	A$ /dmt SC6	89
Tantalum credit[5]	A$ /dmt SC6	(60)
Inventory movement	A$ /dmt SC6	(23)
C1 FOB (excl. royalties and sustaining capital)	**A$ /dmt SC6**	**651**

- The award of underground mining and supply chain logistics contracts,[6] given their significance to overall operating costs (Opex), has enabled a comprehensive review of Opex estimates
- Mining costs are the largest cost driver and converting them into 'units of mine production' results in a 10-year 'average underground mining cost' of A$ 73 per dry metric tonne (dmt) of underground ore mined[6]
- Mining costs benchmark well against comparable underground operations of similar size and scale
- Sustaining capex estimated at A$ 171/dmt over 10-year period (from 1 January 2025), including development and mining infrastructure capital costs
- Opex unit rates may be higher than the average in the ramp up period and in the first years as production increases and fixed costs are diluted

Notes:



finally a DFS that is normal, with normal prices in their expectations:



At normal spodumene prices of just above $1,100 the net present value of the project is at $4.2 billion AUD, the market capitalization now is at $3.7 and thus not much to gain there. Also, with their equity raises and debt this is more complex but nothing wrong with the project from a quick look.

November 2021 DFS Key Metrics

Based on April 2021 MRE – 156Mt @ 1.4% Li_2O and 130ppm Ta_2O_5

NPV[1] (post-tax)	**A$4.2B**
IRR / Payback	57% / 2.3 years
SC6 Opex Years 1-5[3] (FOB)	US$402/dmt US$314/dmt (excl. royalties)
SC6 Opex Years 1-10[3] (FOB)	US$417/dmt US$319/dmt (excl. royalties)
AISC Years 1-10[4] (FOB)	US$452/dmt
Ave. SC6 Price Years 1-10[5] (FOB)	US$1,287/dmt (Based on Roskill price)
Capex[6]	A$473M (incl. $107M Pre-production)

Reserve

68.5Mt @ 1.34% Li_2O &120ppm Ta_2O_5

Mining

2.5 Mtpa (increasing to 4Mtpa)

Total Production Inventory

82.7Mt @ 1.30% Li_2O & 117ppm Ta_2O_5

Opex[3] and AISC (Years 1-10)

Opex: US$417/dmt

AISC: US$452/dmt

Production

SC6: 511Ktpa (increasing to 658Ktpa)

Ta_2O_5 (30%): 428tpa (increasing to 587tpa)

Total Free Cash Flow after tax

+A$12.2B

1. 8% (real). FX assumption of 0.73
2. Refer Cautionary Statement on Slide 2.
3. Operating costs include all mining, processing, transport, state and private royalties, freight to port, port costs and site administration and overhead costs (includes tantalum credits). Excludes sustaining capital.
4. All in Sustaining Capital Costs (AISC), as referred to in this announcement, are cash operating costs including all mining, processing, transport, freight to port, port costs, site administration/ overhead costs, tantalum credits, state and private royalties and sustaining capital.
5. Based on Roskill November 2021 price forecasts
6. Project totals exclude working capital, finance costs, sustaining capital and corporate costs associated with project development

DFS Key Parameters And Assumptions

General and Economic	DFS [1]
Discount rate (real, post-tax)	8%
Weighted average LOM SC6.0 (FOB Geraldton)	US$1,392/t [5]
Weighted average Tantalum LOM 30% conc. (FOB Fremantle)	US$84/lb [6]
Exchange rate – AUD/USD	0.73
Mining and Production	
Average LOM strip ratio (Open Pit)	6:8:1
Processing rate	2.5 to 4Mtpa
Life-of-Mine Production Target (79.6Mt UG & 3.2Mt OP)	82.7 Mt ore
Li_2O & Ta_2O_5 grades (diluted) years 1-10 processed (% / ppm)	1.4% / 126 ppm
LOM average Li_2O & Ta_2O_5 grades (diluted) processed (% / ppm)	1.3% / 117 ppm
LOM average Test Work Li_2O recovery [2]	78%
Overall Ta_2O_5 recovery (% including off-site upgrade losses of ~4%)	38%
SC6.0 grade	6%
Ta_2O_5 Concentrate final grade	30%
Moisture content of SC6.0 concentrate	9%
Average steady state annual tonnes of SC6.0 (Years 2-5 / Years 6-22)	511ktpa / 658ktpa
Average steady state annual tonnes of 30% Ta_2O_5 concentrate (Years 2-5 / Years 6-22)	428tpa / 587tpa

Cost Assumptions	DFS [1]
LOM avg open pit mining costs [3] (A$/dmt ore mined [4])	28
LOM avg U/G mining costs [3] (A$/dmt ore mined [4])	45
LOM average processing cost (A$/dmt ore processed)	22
Logistics and transport (A$/wmt conc. incl. Port Charges)	69
General and admin (A$/dmt ore processed incl. mining)	8
Private and state royalties (A$/dmt)	145
Corporate tax rate	30%
Estimated opening tax losses (A$M)	55

1: Refer Cautionary Statement on Slide 2 | **2.** Based on test work derived grade recovery relationship for DFS was 81%, for purposes of financial modelling a figure of 78% has been applied. | **3:** Includes ROM rehandle | **4:** Excludes pre-production | **5:** Based on Roskill November 2021 price forecast, adjusted to FOB. | **6:** Based on Roskill September 2021 price forecast, adjusted to FOB.